S.58.

Issued in one vol. Jan. 1832

Botanical Department

MEMOIRS

OF THE

WERNERIAN
NATURAL HISTORY SOCIETY,

FOR THE YEARS 1826–31.

VOL. VI.

WITH SIX ENGRAVINGS.

EDINBURGH
ADAM BLACK, NORTH BRIDGE, EDINBURGH;
AND LONGMAN, REES, ORME, BROWN & GREEN,
LONDON.

MDCCCXXXII.

118

BRITISH MUSEUM

PRINTED BY NEILL & CO. OLD FISHMARKET, EDINBURGH.

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BRITISH MUSEUM

MEMOIRS, &c.

A Monograph of the Genus ALLIUM.

By Mr GEORGE DON, A. L. S.

(*Read* 22d *April* 1826.)

THE genus Allium can only be studied satisfactorily from living specimens; for, in Herbaria, the species of this genus, like other liliaceous plants, are seldom found to retain their characters, so as to be recognised with certainty. It fortunately happens that the number of species in our gardens is very considerable. The Botanic Garden at Chelsea contains by far the most extensive collection I have seen, Mr Anderson having been fortunate in raising from seed a great number of new ones, chiefly derived from Russia.

Some years have elapsed since I first directed my attention to the investigation of this difficult genus of plants, the results of which I have now the honour of laying before the Wernerian Society. In the prosecution of this object I have met with considerable obstacles, arising from the difficulty of determining the species already dscribed, and the general intricacy of the whole genus; for, although many of the species afford good and permanent marks of distinction, it must be admitted the limits of others are not so easily determined.

Although the genus Allium is very extensive, I have thought it best to retain it entire, considering it truly natural. In order to facilitate the arrangement of the species, I have divided the genus into divisions and sections, which are severally characterised in their proper places. Some authors have regarded several of these divisions as sufficient to constitute distinct genera.

The Allia are exclusively confined to the temperate zones, with the exception of a very few species, which are found in elevated regions within the tropics; and the greatest proportion of them are found in Europe, and the Asiatic provinces of the Russian empire.

In Allium, the flowers are disposed either in an umbel or a globular head, and the pedicels issue from a common centre; while in the neighbouring genera, Ornithogalum and Scilla, they are always corymbose, with pedicels arising alternately from the sides of the rachis, which as they advance elongate into racemes.

In regard to the synonyma, I have been as careful as my opportunities would admit; and I trust I will be found in many instances to have satisfactorily cleared them up. Much still remains to be done in this intricate genus, notwithstanding the labours of HALLER and Dr TREVIRANUS, and I am far from supposing the present essay complete. My object will be attained, if I have been so fortunate as to lessen the difficulty attending the study of this genus. It is only by degress we can arrive at perfection.

ALLIUM, *Linn. Juss.*

Syst. Lin. HEXANDRIA MONOGYNIA.
Ord. Nat. ASPHODELEÆ, *Juss.*

CHAR. ESSENT. *Perianthium* inferum 6-partitum. *Stamina* 6. *Stigma* sæpius indivisum. *Capsula* supera, trilocularis, trivalvis; *loculis* 1- vel 2-spermis, rarissime polyspermis. *Flores spathacei, umbellati, pedicellati.*

CHAR. GENERALIS. *Perianthium* inferum 6-partitum: laciniæ externæ sæpissime minores, breviores et acutiores. *Stamina* 6, perianthii basi inserta, laciniis opposita iisdem breviora vel longiora. *Filamenta* plus minusve compressa, basi dilatata, interdum basi connata, indivisa, vel alterna latiora tricuspidata, rarissime quinquefida. *Antheræ* incumbentes. *Ovarium* superum, turbinatum, trigonum, plerumque 6-striatum. *Stylus* simplex, teres, erectus, interdum angulatus. *Stigma* obtusiusculum, rarissime trifidum. *Capsula* supera, trigona, trilocularis, trivalvis; *valvis* membranaceis medio septiferis; *loculis* 1- v. 2-spermis, rarissime polyspermis. *Semina* subrotunda vel angulata, testa atra arcte vestita. *Embryo* periphericus, curvatus aut spiralis dimidio albuminis longior.

Bulbus tunicatus, nunc simplex, nunc compositus, et hinc intra commune involucrum plures bulbillos includens, solitarius vel aggregatus, interdum basi rhizomatosus, repens. *Caules* foliosi, vel nudi, solidi vel fistulosi. *Folia* plana, semicylindrica vel teretia, sæpius fistulosa. *Vaginæ* teretes vel ancipites, ore albido membranaceo. *Flores* spathacei umbellati pedicellati; pedicellis communi centro enatis. *Spatha* univalvis vel bivalvis, rarius multifida. Bracteolæ et bulbilli sæpe inter pedicellos.

OBS. Herba tota odore fortissimo, præsertim quando manibus contrita, gaudens; raro (in divisione decima) deest.

PORRUM.

Divisio I.—*Umbella* bulbifera. *Stamina* alterna latiora tricuspidata: *Appendices* laterales plerumque filamentosi torti. *Caules* foliosi.

Sect. 1.—Foliis *linearibus carinatis; carinis marginibusque setoso-serrulatis, carinis laciniarum exteriorum perianthii scabris.*

1. *Allium sativum,* foliis obscurè carinatis, spathâ univalvi caducâ, bulbis compositis membrano involutis.

Allium sativum, Lin. Sp. Pl. 425.—Mat. Med. 92.—Mill. Dict. No. 1.—Reich. 2. 32.—Lam. Encycl. i. p. 66.—Suppl. p. 266.—Mill. Dict. ed. Mart. No. 12.—Desf. Fl. Atl. i. p. 287.—Woodv. iii. p. 460, t. 168. Willd. Sp. Pl. ii. p. 68. Plenk. icon. 254. Brot. Fl. Lus. p. 541. Pers. Syn. i. p. 456. Lam. et Dec. Fl. Fr. iii. pt. i. No. 1952. Lour. Cochin. p. 201. Willd. enum. i. p. 358. Hort. Kew. ii. p. 234. Trev. All. No. 1. Spreng. Sys. ii. p. 33.
A. caule planifolio bulbifero, bulbo composito, staminibus tricuspidatis, Hort. Ups. 76. Mat. Med. 55.
A. radicis bulbo multipartito, capitulo bulbifero, foliis linearibus, Hort. Cliff. p. 137. Roy. Ludb. 39.
A. staminibus alterne trifidis, foliis gramineis, capite bulbifero, radicibus in unum bulbum congruentibus, Hall. All. No. 1. Opusc. p. 331. Monog. No. 1.
A. vulgare vel sativum, Bauh. Hist. ii. p. 554.
A. hortense, Fuch. Hist. p. 736. t. 736.
A. sativum, Lob. Adv. p. 59. Bauh. pin. 73. Tour. Elemen. p. 304. Rup. Jen. p. 122. Morr. Hist. ii. scet. iv. p. 387. t. 14. f. 9.
A. domesticum, Matth. Disc. p. 588. Opera, p. 422. Maath. p. 556.
Allium, Trag. p. 745. Dodon. pempt. 682. Lob. Obs. 80. icon. 158. Park. par. 613. Chab. Stirp. 201. Dios. Lib. Secund. 271. Mat. Med. 232. Cam. epit. 328. Hort. 171. Ger. emac. 178.
A. sativo multifido, Cord. Hist. p. 144.

Hab. in Sicilia. Floret Augusto et Septembri.

Bulbi compositi, membrano albo involuti. *Caulis* teres, 2-pedalis, infra medium foliosus. *Folia* linearia, acuta, supra canaliculata, subtus obscure carinata, marginibus et carinis sursum sub microscopum minutissime serrulatis, pedalem longa $\frac{1}{4}$ unciam basi lata, disticha, glau-

cescentia. *Vaginis* teretibus striatis. *Spatha* univalvis, calyptræformis, apice cornuta, caduca. *Umbella* bulbifera; *bulbi pedicelli*que membranis intermixti. *Stamina* perianthio rubro paulo breviora. *Filamenta* alterna latiora, tricuspidata: *setis* longis tortis.

Obs. This plant, although common in our gardens, is seldom to be met with in flower.

2. *All. Ophioscorodon*, caule apice ante anthesin contorto, spathâ univalvi caducâ, bulbis compositis lateralibus cordatis membrano vestitis.

Allium Scorodoprasum, β Lin. Sp. Pl. 426.
A. Scorodoprasum, Fl. Græc. prod. p. 223. Lam. Encycl. i. p. 66. Brot. Fl. Lus. i. p. 541.
A. sativum β Trev. All. No. 1.
A. staminibus alterne trifidis, capite bulbifero, scapo ante maturitatem contorto, Hall. All. No. 2. opusc. p. 334. Monogr. No. 2.
Porrum radice laterali cordata solida, pedunculo revoluto, capite bulbifero, Hort. Cliff. 136. Roy. Ludb. 40.
A. sativum alterum, sive Allioprassum caulis summo circumvoluto, Bauh. pin. 73. Morr. ii. sect. 4. p. 387. t. 15. f. 10. Mill. Dict. No. 2.
Scorodoprasum alterum, bulboso et convoluto capite, Park. Theat. 873. Rai Hist. p. 1120, No. 4.
Allium capite ex multis bulbis conflato et contorto, Bauh. Hist. ii. p. 104.
Allii, genus Ophioscorodon dictum quibusdam, Bauh. Hist. ii. p. 559. Chab. Hist. p. 201.
Ophioscorodon, Math. Opera, p. 421. Ger. emac. p. 181.
Allium sativum secundum, Bauh. pin. 73.
A. creticum scorodoprasum, Cam. Hort. p. 9.
Scorodoprasum, sive Allioprasum, Lob. Adv. 58.; et contorte, Bauh. Hist. ii. p. 559. Bauh. pin. 74. (Allioporum.)
S. secundum, Clus. Hist. 191. Pann. p. 210.
Allium sativum amphicarpum, Cord. Hist. p. 144.

Hab. in Græcia propria, Creta, &c. Floret Augusto et Septembri.

Allium Ophioscorodon is often to be met with in our culinary gardens, where it is cultivated under the name of *Rocambole*.

3. *All. contraversum*, caule apice ante maturitatem convoluto, spathâ univalvi caducâ, staminibus perianthio brevioribus, bulbo simplici.

Allium contraversum, Schrad. in Willd. enum. i. p. 358.
A. ophioscorodon, Link. enum. i. p. 318. Spreng. Sys. ii. p. 33.
A. sativum, var. γ, Trev. All. No. 1.
A. sativum radice simplici, Bauh. pin. 74.
A. mas, Math. ex Bauh. pin. 74.
Allio simplici, Cord. Hist. p. 144.
A. sativum singulari capite, et A. masculum, Vercell. ex Bauh. pin. 74.
A. bulbo simplici, Ger. Gall. Prov. p. 151.

Hab. in Ægypto, in Gallia, *Ger.* Floret Augusto.

Bulbus simplex; *tunicis* externis læte fuscis. *Caulis* teres, 2-pedalis, crassitudine pennæ anserinæ, foliosus, semper sub flore in annulum flexus. *Folia* ¾ pedis longa, linearia, acuta, carina marginibusque setoso-serrulatis, glaucescens; *vaginis* compressiusculis sulcatis vel striatis. *Spatha* univalvis, calyptriformis, apice cornuta, decidua. *Umbella* bulbifera; bulbis rotundis fuscis, membranis intermixtis congesta. *Pedicelli* filiformes, unciales. *Perianthium* erectum purpureum, staminibus longius. *Filamenta* alterne latiora, tricuspidata: *setis* longis tortis.

Obs. I have not seen this plant any where else but in the Botanic Garden at Chelsea. It is a more robust plant than the preceding, and the stems more leafy. It was supposed by Gerard to be the original of *All. sativum.*

4. *All. arenarium*, vaginis teretibus, umbellâ multiflorâ, spathâ 2 v. 3-valvi muticâ persistente, perianthii laciniis ovato-lanceolatis acutis, staminibus perianthio brevioribus.

Allium arenarium, Lin. Sp. Pl. 426. iter Scania, 227. Fl. Suec. ed. 2. p. 104. With. 343. Vill. Delph. ii. p. 254. Lam. Encycl. i. p. 66. Suppl. p. 266. Roth. Germ. i. p. 146; ii. p. 381, Mill. Dict. ed. Mart. No. 4. Willd. Sp. Pl. ii. p. 69. Fl. Brit. 556. Eng. Bot. ix. t. 1358. Pers. Syn. i. p. 456. Willd. enum. i. p. 358. Hort. Kew. ii. p. 234. Hook. Scot. 100. Eng. Fl. ii. p. 134. Spreng. Sys. ii. p. 33.
A. carinatum, Schult. ex Steud. Nomen.
A. foliis ciliatis, umbella bulbifera, staminibus alterne trifidis, Hall. Helv. ii. p. 106. No. 1222.
A. staminibus alterne trifidis, capite bulbifero foliis gramineis læviter serratis, Hall. All. No. 3. opusc. p. 336. Monogr. No. 3.
Porrum planifolium, staminibus alterne trifidis, umbella bulbifera, Rupp. Jen. ed. 3. p. 154. cum icon. 2.
Moly pannonicum latifolium primum, Parks. Theat. p. 872.
Moly montanum pannonicum bulbiferum primum, Parks. Parad. p. 142.

Allium montanum bicorne latifolium, flore dilute purpurascente, Bauh. pin. 74. Raii Hist. p. 1119. No. 1. Rudb. Elys. p. 155. Rupp. Fl. Jen. p. 153.
A. sylvestre amphicarpon, foliis porraceis, floribus et nucleis purpureis, Raii Syn. ed. 2. p. 230. ed. 3. p. 370. Rand. Hort. Cels. p. 9. Mill. Dict. No. 4.
A. sylvestre, Chab. Stirp. p. 201. Tab. icon. 486. ob latifolia.
A. seu Moly montanum, latifolium primum, Clus. Pann. 213. Hist. i. p. 193. Bauh. Hist. ii. p. 560. Ger. emac. 187. f. 4. Parks. Theat. p. 873.

Hab. in Thuringia, Helvetia, Suecia, &c. Floret Augusto et Septembri.

Bulbus parvus, ovatus, fuscus, basi bulbillos emittens. *Caulis* erectus, 2 v. 3-pedalis, infra medium foliosus. *Folia* ad basin semiunciam lata, pedem longa, linearia, acutiuscula; carina marginibusque scabro-serrulatis. *Vaginæ* teretes, striatæ, interdum obscurè bicarinatæ. *Spatha* 2 v. 3-valvis mutica obtusa, longitudine pedunculorum inferiorum. *Umbella* bulbifera, multiflora, membranis intermixta. *Pedicelli* breves, virides. *Perianthium* rubrum: laciniis oblongo-lanceolatis, acutis apice paulo recurvis, carinis saturatioribus, exteriorum scabro-setosis. *Stamina* perianthio breviora. *Filamenta* basi dilatata, purpurea, alterna latiora tricuspidata. *Antheræ* oblongæ, purpureæ, effœtæ nigræ: setis longis tortis, polline ochroleuco. *Pistilla* staminibus subæqualia. *Ovarium* rotundatum, viride. *Stylus* teres. *Stigma* obtusiusculum.

Obs. I am not aware of any figure of this plant which can be fully depended upon, except the one in "English Botany." Both the figures in "Flora Danica," which have been so often quoted for *Allium arenarium*, are evidently *Allium scorodoprasum*. *Allium arenarium* of Thunberg's "Flora Japonica" is perhaps a distinct species.

5. *All. scorodoprasum*, vaginis ancipitibus, umbellâ pauciflorâ, spathâ 2-valvi mucronatâ persistenti, perianthii laciniis ovato-lanceolatis acutiusculis stamina æquantibus.

Allium scorodoprasum, Lin. Sp. Pl. 425. Fl. Suec. ed. 2. p. 103. Mill. Dict. No. 2. Fl. Dan. t. 290 et 1455. Scop. Carn. ed. 2. i. p. 236. Reich. 2. 32. Poll. Pal. No. 326. Vill. Delph. ii. p. 253. Hofm. Germ. 116. Roth. Germ. i. p. 145; ii. p. 381. Mill. Dict. ed. Mart. No. 13. Willd. Sp. Pl. ii. p. 69. Lap. Fl. Pyr. abr. 179.

Plenk. icon. 256. Pers. Syn. i. p. 426. Lam. et Decand. Fl. Fr. iii. pt. i. No. 1953. Willd. enum. i. p. 358. Bess. Fl. Gallic. i. p. 232. Hort. Kew. ii. p. 234. Spreng. Sys. ii. p. 33.
A. arenarium, Red. Lilia. vii. t. 379. Var. α et β Trev. All. No. 2.
A. caule planifolio bulbifero, foliis crenulatis, vaginis ancipitibus, Hort. Ups. p. 77.
Porrum caule folio perforante, Mor. Hist. ii. sect. iv. p. 387. t. 15. f. 4.
Allium rubentibus nucleis, Lob. icon. 158. Morr. Hist. ii. p. 387. sect. iv. t. 14. f. 1.
Porrum sylvaticum vetigeneum, Ger. emac. 176.

Hab. in Œlandia, Dania, Pannonia, Germania, Gallia, Suecia, &c. Floret Augusto et Septembri.

Bulbus ovatus, fuscus, bulbillos nigros emittens. *Caulis* sesqui v. 2-pedalis, teres, fere infra medium foliosus. *Folia* lineari-lanceolata, acutiuscula, prope basin ½ unciam lata fere pedem longa: carina marginibusque setoso-serrulatis. *Vaginæ* ancipites. *Spatha* 2- vel 3-valvis, mucronata, bulborum longitudine. *Umbella* bulbifera; bulbis ovatis acutis violaceis, membranis intermixtis conferta. *Pedicelli* pauci, purpurei, fere unciales. *Perianthium* rubrum, mediocre: *laciniæ* ovato-lanceolatæ, acutiusculæ, apice paulo recurvæ, exteriorum carina scabra. *Stamina* perianthio subæqualia. *Filamenta* basi dilatata, albida, apice purpurea, alterna latiora tricuspidata. *Antheræ* oblongæ fuscæ, effœtæ nigræ. *Ovarium* rotundatum viride, apice purpurascens. *Stylus* teres, albidus. *Stigma* obtusiusculum.

Obs. This plant may be easily distinguished from the preceding (which it closely resembles) by its two-edged or two-keeled sheaths, and the plant being much more robust. There has evidently much confusion existed between these two species.

Sect. 2.—Foliis *linearibus dorso convexis.*

6. *All. littoreum*, caule basi folioso, foliis obtusis, spathâ univalvi caducâ, umbellæ radiis laxis, staminbus corollam æquantibus.

Allium littoreum, Bertol. Fl. Gen. 51. Spreng. Sys. ii. p. 33.
A. monspesulanum, Willd. enum. Suppl. p. 16. Link. enum. i. p. 318.

Hab. in Gallo provin. Narbonia, Italia, &c.

Caulis teres, infra medium foliosus. *Folia* linearia, subtus convexa.

Obs. A. carinato simillimum, sed differt staminibus tricuspidatis, et umbella minore.

Sect. 3.—Foliis *teretibus fistulosis.*

7. *All. vineale*, caule gracili, foliis striatis asperis, spathâ univalvi caducâ, capite sphærico congesto, perianthii laciniis obtusis, staminâ duplo brevioribus.

Allium vineale, Lin. Sp. Pl. 428. Reich. 2. 36. Poll. pal. No. 329. Huds. Ang. 139. Lam. Encycl. i. p. 67. Suppl. p. 267. Krok. Fl. Silesia, t. 44. Vill. Delp. ii. p. 256. Hoffm. Germ. 117. Roth. Germ. i. p. 146; ii. p. 383. Schrad. Spic. Fl. Germ. ii. p. 84. Mill. Dict. ed. Mart. No. 23. With. 343. Willd. Sp. Pl. ii. p. 78. Lap. Fl. Pyr. abr. p. 181. Fl. Brit. ii. p. 359. Eng. Bot. xxviii. t. 1974. Brot. Fl. Lus. p. 543. Pers. Syn. i. p. 456. Lam. et Decand. Fl. Fr. iii. pt. i. No. 1976. Willd. enum. i. p. 359. Hort. Kew. ii. p. 236. Eng. Fl. ii. p. 137. Spreng. Sys. ii. p. 33.
A. radice multiplici, foliis fistulosis, capite sphærico bulbifero, staminibus alterne trifidis, Hall. Helv. ii. No. 1221.
A. staminibus alterne trifidis, foliis fistulosis, capite bulbifero sphærico, radice multiplici, Hall. All. No. 4. Opusc. p. 338. Monogr. No. 4.
Scorodoprasum montanum, juncifolium, nucleis capitulorum ciceris magnitudine plerumque crinitu et purpurascentibus, floribus concoloribus, Michel. Gen. p. 25.
Allium caninum, Trag. 750.
A. sylvestre campestre purpurascens, Rudb. Elys. ii. p. 153. Rupp. Jen. p. 155. Bauh. pin. 74.
A. campestre juncifolium purpurascens capitatum majus et minus, Bauh. pin. 74. Rudb. Elys. ii. p. 153. f. 11 et 12.
Porrum sylvestre vinearum, Bauh. pin. 74. Mag. Bot. p. 22.
Cepa juncifolio minor purpurascens, Rand. Hort. Chels. p. 47.
Allium sylvestre, Raii Syn. p. 369. Hist. p. 1117. No. 4. Ger. emac. 179. Park. Theat. p. 171.
A. sylvestre tenuifolium, Dod. Pempt. 683. Lob. icon. 156. f. 2. Adver. p. 59.
A. cervinum, Trag. p. 750.
A. sylvestre primum, Fuchs. Hist. 737.

Hab. in Anglia, Germania, Lusitania, Gallia, Silesia, &c. Floret Augusto et Septembri.

Bulbus parvus, ovatus, albus. *Caulis* gracilis, teres, striatus, 1- v. 2-pedalis, fere infra medium foliosus. *Folia* cylindrica, fistulosa, sulcata, aspera, glaucescentia supra canaliculata, fere pedem longa, sub florescentiam emarcida. *Spatha* univalvis, caduca, apice longe cornuta, rarius in bivalvibus fissa. *Umbella* bulbifera; *bulbi* ovati, virides, congesti, acuti, vel acuminati, membranis intermixti. *Pedunculi* pauci, purpurei, fere unciam longi,, apice incrassati. *Perianthium* mediocre pallidi-roseum ; *lacineæ* oblongæ, obtusæ, lineis viridibus carinatæ. *Stamina* perianthio duplo longiora. *Filamenta* basi dilatata, alba, apice pallide purpurea, alterna latiora, tricuspidata: *setis* longis tortis. *Antheræ* oblongæ, purpureæ, effœtæ nigræ: *polline* ochroleuco. *Pistilla* staminibus plerumque multo breviora. *Ovarium* oblongum, turbinatum, viride, sexangulatum. *Stylus* brevissimus, teres, albus. *Stigma* obtusiusculum.

Var. β *majus*, capite bulbifero confertissimo plerumque geminato, spatha univalvi caduca, apice abrupte acuminata.

Allium compactum, Thuil. Fl. Par. p. 167. Pers. Syn. i. p. 456.
A. campestre, Schleich. Cat. Pl. Helv.
A. sylvestre gemino capite, Rudb. Elys. ii. p. 144. Rand. Hort. Chel. p. 9.
Porrum sylvestre capite gemino, Bauh. pin. 74. Morr. Hist. ii. sect. iv. p. 391. t. 15. f. 3.
Ampeloprasum, sive Porrum sylvestre, Lob. icon. 155. Ger. emac. p. 176.

Hab. in Gallia, Helvetia.

8. *All. Purshii*, caule gracili, foliis asperis, umbellâ conferta irregulari proliferâ, spathâ univalvi caducâ, perianthii laciniis lanceolatis obtusis, staminibus perianthio duplo longioribus.

Allium vineale, Pursh. Fl. Amer. Septen. i. p. 222. Torrey, Fl. i. p. 340.
A. Canadense, Hortula.

Hab. in Canada. Floret Augusto.

Bulbus parvus, rotundatus, albus, gregarius. *Caulis* gracilis teres, 2-pedalis, crassitudine pennæ corvinæ, infra medium foliosus. *Folia* teretia, angustissima, fistulosa, acuta, striata, aspera, supra canaliculata, sub florescentiam sicca ; *vaginæ* longæ, teretes, striatæ vel sulcatæ. *Spatha* univalvis, apice cornuta, caduca. *Umbella* bulbifera, prolifera ; bulbis ovatis obovatisque, mucronatis, interdum apice foliosis, membranis intermixtis conferta. *Pedicelli* plures, teretes, irregulares, purpurei, semi v. sesquiunciales ; alteris umbelluliferis. *Spathæ* umbellularum bivalves. *Perianthium* parvum, atropurpureum ; *laciniæ* æquales, lanceolatæ, obtusæ ; *carina* fere nigra. *Stamina* inæqualia, perianthio fere duplo longiora. *Filamenta* basi dilatata læte purpurea, apice albida, alterna latiora, longiora, tricuspidata; setis longis tortis. *Antheræ* purpureæ, effœtæ nigræ; *polline* ochroleuco. *Pistilla* staminibus breviora, raro longiora. *Ovarium* ovatum, viride, trigonum. *Stylus* teres, purpureus. *Stigma* album, obtusiusculum. *Capsula* trigona: *loculis* 2-spermis.

Obs. Messrs Loddiges of Hackney received this plant from Canada under the name of *Allium Canadense*. I have little doubt but it is *Allium vineale* of Pursh.

Sect. 4.—Caule *foliisque inflato-fistulosis.*

9. *All. proliferum*, caule basi folioso, umbellâ proliferâ, spathâ bivalvi, staminibus perianthio longioribus: dentibus brevibus obtusis, perianthii laciniis oblongis obtusis.

Allium proliferum, Schrad. Cat. Hort. Gœt. 1812. Willd. enum. i. p. 358. Link. enum. p. 320. Spreng. Sys. ii. p. 33.
A. cepa, Var. β Bot. Mag. No. 1469.

Hab. in Canada? vel Ægypto? Floret Julio.

Bulbus rotundatus, solitarius, depressiusculus; *tunicis* externis fusco-rubentibus. *Folia* disticha, cylindrica, fistulosa, inflata, acuta. *Caulis* basi foliosus, sesquipedalis, inflato-fistulosus, foliis longior. *Spatha* bivalvis; valvis ovatis acuminatis longitudine bulborum. *Umbella* bulbifera, prolifera; *bulbi* rotundati, rubentes, viridi-striati, pedicellis membranis ramisque intermixti. *Perianthium* album, expansum: laciniæ oblongæ, obtusæ, subcrenulatæ, dorso lineolis viridibus. *Stamina* æqualia, perianthio longiora. *Filamenta* plana, alba, alterna basi latiora trifida; dentibus lateralibus brevibus obtusis, basi membranaceo conniventibus. *Antheræ* luteo-virides. *Pistilla* staminibus breviora. *Ovarium* rotundatum, album, trigonum. *Stylus* teres, albus. *Stigma* acutiusculum.

Obs. This species is cultivated in our gardens, not uncommonly, under the name of Tree-onion.

DIVISIO II.—*Umbella* capsulifera. *Stamina* alterna latiora tricuspidata: *appendices laterales* filamentosi, torti. *Caules* foliosi.

SECT. 1.—Foliis *linearibus carinatis; marginibus carinaque setosis vel scabris, perianthii laciniarum exteriorum carina scabris.*

10. *All. Porrum*, spathâ univalvi caducâ, umbellâ sphæricâ, perianthii laciniis oblongis obtusis, staminibus perianthio subæqualibus, bulbo simplici.

Allium Porrum, Lin. Sp. Pl. 423. Lam. Encycl. i. p. 64. Suppl. p. 263. Mill. Dict. ed. Mart. No. 2. Desf. Fl. Atl. i. p. 285. Willd. Sp. Pl. ii. p. 64. Plenk. icon. 253. Brot. Fl. Lus. p. 550. Pers. Syn. i. p. 355. Lam. et Dec. Fl. Fr. iii. pt. i. No. 1950. Willd. enum. i. p. 357. Hort. Kew. ii. p. 232. Trev. All. No. 7. Spreng. Sys. ii. p. 34.
A. lætum, Salisb. Hort. chap. All. p. 235. Pollini ex Steud.
A. radice ambeunte tunicata, foliis gramineis, spica sphærica, staminibus alterne trifidis, Hall. Helv. ii. No. 1217.
A. staminibus alterne trifidis, foliis gramineis, floribus sphærice congestis, radice tunicata, cauli circumnata, Hall. All. No. 7. Opusc. p. 348. Monogr. No. 6.
Porrum radice ambiente tunicata, oblonga, solitaria, Lin. Hort. Cliff. 136. Roy. Lugbd. 40.
Porrum sativum, Mill. Dict. No. 1.
Porrum commune capitatum, Bauh. Bas. p. 20. pin. 72. Morr. Hist. ii. sect. iv. p. 387. t. 15. f. 1. Magn. Chart. p. 183. Math. Disc. p. 581. Black. icon. 421. Rudb. Elys. ii. p. 142.
Porrum, Cam. epit. p. 321. Cæsalp. p. 407. Bauh. Hist. ii. p. 551. Taber. icon. 484. Dodon. pempt. 688. Raii Hist. p. 1126. No. 1.
P. capitatum, Fush. Hist. p. 633. t. 634. Diosc. lib. ii. p. 269. Mat. Med. p. 230. Ger. emac. p. 174.
P. capitatum vulgare, Cam. Hort. p. 132.
P. commune, Matth. p. 551. Opera, p. 417.
β All. caule planifolio umbellifero, staminibus tricuspidatis, radice tunicata, Hort. Ups. p. 77. Mat. Med. p. 55.
Porrum sylvestre latifolium, Tab. icon. 486.
P. tonsile et capitatum, Lob. Obs. p. 78.
P. capitatum et sectile, Lob. Adv. p. 58.
P. sectivum, Ruell. 3. p. 523. Dodon. pempt. 688. Fush. Hist. p. 636. t. 635.

P. sectivum latifolium, Bauh. pin. 72. Morr. ii. sect. iv. p. 390. t. 15. Rudb. Elys. p. 141. Mill. Dict. No. 2.
P. sectile, Matth. Disc. p. 550.
P. sectivum aut tonsile, Ger. emac. p. 174.

Hab. in vineis Helvetiæ. Floret Julio.

Bulbus oblongus, solitarius, albus. *Caulis* 2-pedalis et ultra, rigidus, teres, lævis, glaucus, fere infra medium foliosus. *Folia* lineari-lanceolata, glauca, basi 2-unciam lata, versus apicem attenuata, acuta, sesquipedalem longa; marginibus sursum carinisque scabro-serrulatis, subopposita. *Vaginæ* teretes. *Spatha* univalvis, calyptriformis, apice cornuta caduca. *Umbella* globosa, confertiflora, regularis. *Pedicelli* filiformes, teretes, virides, basi purpurei, unciam longi. *Perianthium* dilutè purpurascens semiapertum; *laciniæ* oblongæ, obtusæ, cucullatæ, margine albo, medio purpureo, carino viridi, exterioris scabro, pictæ. *Stamina* perianthio paulo longiora. *Filamenta* alba, basi dilatata, post maturitatem reflexa, alterna, latiora, tricuspidata; setis longis tortis. *Antheræ* oblongæ, purpureo-luteæ. *Pistilla* staminibus plerumque breviora, primum brevissima. *Ovarium* oblongum, viride, obscure trigonum. *Stylus* teres, albus. *Stigma* obtusiusculum. *Capsula* rotunda, obtuse trigona, trilocularis; *loculis* 2-spermibus.

Obs. There are numerous varieties of the Leek cultivated for culinary purposes; none of these I have thought of sufficient consequence to mention, except var. β, which has been long enumerated by ancient authors, and is now quoted above as a synonym.

11. *All. ampeloprasum*, spathâ univalvi caducâ, umbella globosa irregulari, perianthii lanciniis ovato-lanceolatis acuminatis, extus scabris, staminibus perianthio longioribus, radice laterali solido.

Allium ampeloprasum, Lin. Sp. Pl. 423. Reich. 2. p. 28. Huds. Angl. 138. Lam. Encycl. i. p. 64. Suppl. p. 263. Hoffm. Germ. 115. Mill. Dict. ed. Mart. i. No. 1. Bot. Mag. No. 1385. With. 342. Willd. Sp. Pl. ii. p. 63. Fl. Brit. 355. Eng. Bot. xxiv. t. 1657. Brot. Fl. Lus. p. 540. Pers. Syn. i. p. 355. Lam. et Dec. Fl. Fr. iii. pt. i. No. 1951. Red. Lilia. vii. t. 385. Willd. enum. i. p. 357. Hort. Kew. ii. p. 232. Eng. Fl. ii. p. 133. Spreng. Syst. ii. p. 34.
A. montanum majus Anglicum, Newtonii ex Raii Hist. p. 1125. No. 2.

A. holmense sphærico capite, Raii Syn. ii. p. 229; iii. p. 370. Mill. Dict. No. 6.
A. majus, foliis porraceis, sphærico capite ex multis floribus albis conflato, Morr. ii. sect. iv. p. 387. t. 15. f. 12.
A. sphærico capite folio latiore, S. scorodoprassum alterum, Bauh. pin. 74. Rudb. Elys. ii. p. 151. Morr. Hist. ii. sect. iv. p. 387. t. 15. f. 12.
Scorodoprasum dictum, Bauh. Hist. ii. p. 558. Raii Hist. ii. p. 1121. Parks. Theat. p. 872. Chab. p. 201.
Porrum folio latissimo, Bauh. Pin.. 72.
Scorodoprasum latifolium spontaneum italicum, floribus dilute purpureis odoratis, Mich. Gen. 25. t. 24. f. 5.
Ampeloprasum, Dodon. pempt. 689. f. 690. Matth. Disc. 582. Opera, 418. Dioscor. lib. secund. 269. Cam. epit. p. 323.
Allium Syriacum. Tab. icon. 484.
Scorodoprasum primum, Clus. Hist. i. p. 190. et Pann. 208. Lob. icon. p. 157. Ger. emac. 180. Mor. Hist. sect. iv. p. 387. t. 15. f. 11.
Scorodoprasum, Cam. epit. p. 331.

Hab. in orient. Germania, Gallia, Lusitania, inque Insula Holms Angliæ. Floret Julio.

Bulbus ovato-rotundatus, gregarius, soboliferus, laterali solido. *Caulis* 5 vel 6-pedalis, teres, glaucus, fere infra medium foliosus. *Folia* alterna, 2-pedalia, prope basin 2 uncias lata, apicem versus attenuata, acuta, glauca: marginibus denticulatis scabris, carina superne serrulata. *Vagina* teres. *Spatha* univalvis, calyptræformis, apice cornuta, caduca, nunc in valvis 2 fissa, persistens. *Umbella* subglobosa, irregularis, confertiflora. *Pedicelli* purpurascentes, teretes, sesquiunciam longi. *Perianthium* semi-apertum, dilute purpurascens, ante expansionem acuminatum; *laciniæ* ovato-oblongæ, acuminatæ, extus scabro-setosæ; carinis viridibus. *Stamina* subæqualia perianthio multo longiora. *Filamenta* alba, basi dilatata, marginibus ciliatis; alterna latiora, tricuspidata, setis longis tortis. *Antheræ* oblongæ, luteæ. *Pistilla* staminibus æqualia, vel sæpe breviora. *Ovarium* rotundum, trigonum, viride. *Stylus* teres, albus. *Stigma* obtusiusculum, interdum obscure bifidum. *Capsula* obtuse trigonum: *loculis* 2-spermibus.

12. *All. rotundum*, spathâ univalvi, caducâ, perianthii laciniis exterioribus lanceolatis obtusis, interioribus ovato-oblongis obtusis, staminibus perianthio longioribus, bulbis grumosis.

Allium rotundum, Lin. Sp. Pl. 423. Reich. ii. p. 30. Poll. pal. p. 325. All. pedem. No. 1867. Lam. Dict. i. p. 65. Suppl. p. 264.

Gært. Fruct. i. p. 56. t. 16. f. 2. Vill. Delph. ii. p. 251. Roth. Germ. i. p. 145; ii. p. 397. Hoff. Germ. 115. Mill. Dict. ed. Mart. i. No. 4. Willd. Sp. Pl. ii. p. 65. Pers. Syn. i. p. 355. Lam. et Dec. Fl. Fr. v. No. 1951. Prod. Fl. Græc. i. p. 222. Fl. Taur. Cauc. i. p. 261. Spreng. Sys. ii. p. 34.
A. ampeloprasum, Var. β, Trev. All. No. 8.
A. ampeloprasum, Habl. Taur. 161.
A. descendens, Pall. ined. ex Steud.
A. radice multiplici, foliis gramineis, spica sphærica, staminibus alterne trifidis, Hall. Helvet. ii. No. 1219.
A. staminibus alterne trifidis, spica sphærica, foliis gramineis, radice multiplici, Hall. All. No. 8. Opusc. p. 350. Monogr. No. 7.
Porrum radice granulata s. grumosa, Rupp. Fl. Jen. p. 154. ed. iii.
Allium montanum capite rotundo, Bauh. pin. 75. Morr. Hist. ii. sect. iv. p. 387. t. 14. f. 4. Rudb. Elys. ii. p. 157.
A. sphæriceo, folio angustiore, Bauh. pin. 74.
A. sphærocephalum bifolium, floribus purpureis in globum congestis, Chab. p. 202.
A. s. Moly montanum, 5. Clus. Hist. p. 195. Pann. p. 219 et 220.
Scorodoprasum minus, Ger. emac. p. 181.

Hab. in Europa Australiori. Floret Julio.

Bulbus ovatus grumosus, bulbillis nigris, inter tunicam albam congestis. *Caulis* sesqui vel 2-pedalis, teres, lævis, glaucescens, erectus, crassitudine pennæ corvinæ, inferne foliosus. *Folia* lineari-lanceolata, basi ½-unciam lata, apicem versus attenuata, fere pedem longa, marginibus carinaque setoso-serrulatis; *vaginæ* compressiusculæ. *Spatha* univalvis, mucrone brevi cornuta, caduca. *Umbella* sphærica, congesta. *Pedicelli* purpurascentes, teretes, filiformes, fere unciam longi. *Perianthium* purpureum, ante expansionem globosum; laciniæ exteriores lanceolatæ, carina scabris; interiores ovato-oblongæ, obtusæ paulo longiores et latiores, carina viridi-purpureis, lævibus. *Stamina* perianthio longiora. *Filamenta* alba, basi dilatata, alterna latiora, tricuspidata, post maturitatem reflexa, setis longis tortis. *Antheræ* purpurascentes; *polline* luteo-ochroleuco. *Pistilla* staminibus plurimum breviora, nunc brevissima. *Ovarium* subrotundum, viride. *Stylus* albus, teres. *Stigma* obtusiusculum. *Capsula* rotundata, obtuse trigona: *loculis* 2-spermibus.

13. *All. Hallerii*, spathâ univalvi caducâ, perianthii laciniis externis lanceolatis obtusis, intimis ovato-oblongis obtusis brevioribus, staminibus perianthio longioribus, bulbis soboliferis laterali solido.

Allium ampeloprasum, Fl. Græc. t. 312. Prod. i. p. 221. Trev. All. No. 8.

A. radice sobolifera, foliis gramineis, spica sphærica, staminibus alterne trifidis, Hall. Helv. ii. No. 1218. Monogr. No. 5.
A. staminibus alterne trifidis, foliis gramineis, floribus sphærice congestis, radice sobolifera, Hall. All. No. 5. Opusc. p. 344.

Hab. in Græcia, Helvetia, &c. Floret Julio.

Caulis bipedalis ad tripedalis. *Folia* ¾ ad ½-unciam lata, fere pedalem longa.

Obs. Many other authors, besides those quoted, who have mentioned *Allium ampeloprasum*, may also mean this plant, but it is now impossible to determine.

14. *All. rubicundum*, nervis vaginæ scabris, spathâ univalvi caducâ, umbella globosâ, perianthii laciniis exterioribus ovato-oblongis, interioribus ellipticis apice rotundatis, staminibus perianthio æqualibus.

Allium rubicundum, Niven in litteris.
A. ampeloprasum, β rubicundum, Bot. Mag. No. 1560.
A. margaritaceum, Mœnch ex Steud.

Hab. in promontorio Bonæ Spei. Floret Julio et Augusto.

Bulbus basi multipartitus. *Caulis* erectus, teres, glaucus, 1 v. sesquipedalis, fere infra medium foliosus. *Folia* pauca, linearia versus apicem attenuata, fere pedem longa, glauca, marginibus carinaque setoso-ciliatis. *Vagina* striata: nervis scabris. *Spatha* univalvis, cornuta, prope basin abrupte truncata, caduca. *Umbella* globosa, confertiflora. *Pedicelli* centrales perianthio multo longiores. *Perianthium* rubro-marmoratum: laciniæ æquilongæ, externæ ovato-oblongæ, concavæ, cum carinis scabris, intimæ latiores, ellipticæ; apice rotundatæ. *Stamina* perianthio æqualia. *Filamenta* basi dilatata, alba, alterna latiora, tricuspidata, omnia conniventia, post maturitatem reflexa: setis longis tortis. *Ovarium* rhombeo-ovatum, sexstriatum. *Stylus* brevis, teres. *Stigma* obtusiusculum. *Capsula* obtuse trigona: *loculis* 2-spermibus.

Obs. This plant was first discovered at the Cape of Good Hope by Mr Niven. It may be easily distinguished from any of its congeners, by its marbled flower, and the stamens being equal in length with the perianth, and more especially by the nerves of the sheaths being setose.

15. *All. Waldsteini*, spathâ univalvi caducâ, umbellâ globosâ, perianthii laciniis ovatis acutis, exterioribus paulò brevioribus, staminibus perianthium æquantibus, bulbo bulbillos atro-purpureos emittente.

A. ampeloprasum, Walds. et Kit. Pl. rar. Hung. p. 84. t. 82.

Hab. in arvis et pratis Smyrnæ. Floret Junio et Julio.

Bulbus compositus, bulbillos atropurpureos emittens, setis albis tenuis adfixus. *Caulis* 1- vel 2-pedalis erectus, infra medium foliosus. *Folia* linearia, acuta, striata, subcarinata, marginibusque sursum serrulato-ciliatis. *Vaginæ* atropurpureæ. *Spatha* univalvis, cornuta, caduca, prope basin abrupte truncata. *Umbella* globosa, densa. *Perianthium* mediocre, atropurpureum: lacineæ ovatæ, acutæ; *externæ* paulo breviores et angustiores, carinâ scabrâ. *Stamina* perianthium æquantia. *Filamenta* alba, basi dilatata, margine ciliata, alterna latiora tricuspidata: setis longis tortis. *Antheræ* pallide purpurea: *polline* albo. *Ovarium* trigonum, sexstriatum. *Stylus* brevis, teres, albus. *Stigma* obtusiusculum.

Obs. This plant may also be easily distinguished by its bulbs emitting dark purple offsets, and by its very dark purple flowers.

16. *All. exsertum*, spathâ univalvi deciduâ, umbellâ subglobosâ, perianthii laciniis externis ovato-lanceolatis acuminatis, internis oblongis cucullatis obtusis, staminibus perianthio fere triplo longioribus.

Hab. in Russia? Floret Julio et Augusto.

Bulbus oblongus, solitarius, albus. *Caulis* tripedalis, teres, glaucus, crassitudine pennæ gallinaceæ, fere infra medium foliosus. *Folia* linearia, apicem versus attenuata, acuta, pedalia, basi $\frac{1}{3}$ unciæ lata, glauca, carinâ marginibusque sursum setoso-serrulatis. *Vagina* teres, striata. *Spatha* univalvis, apice cornuta, decidua. *Umbella* subglobosa, irregularis. *Pedicelli* teretes, filiformes, pallide rubri, fere unciam longi. *Perianthium* pallide rubrum; *laciniæ exteriores* ovato-lanceolatæ, acuminatæ, cum carinâ fusco-purpureâ setosâ; *interiores* oblongæ, obtusæ, cuculatæ, paulo breviores, dorso lineolis fusco-purpureis notatæ. *Stamina* perianthio fere triplo longiora. *Filamenta* alba, basi dilatata, alterna latiora, tricuspidata: setis longissimis tortis. *Antheræ* oblongæ, luteæ: *polline* ochroleuco. *Pistilla* staminibus breviora. *Ovarium* subrotundum, trigonum, sexstriatum, viride. *Stylus* teres, albus. *Stigma* obtusiusculum. *Capsula* rotunda, obtuse trigona: *loculis* 2-spermis, nunc altero loculo abortiente.

OBS. The seeds from which this plant was raised, were received by Mr ANDERSON of the Chelsea Botanic Garden about five years ago, under the name of *All. lineari affine*, from Mr OTTO of Berlin.

17. *All. erectum*, foliis obscure carinatis, spathâ univalvi caducâ, umbellâ laxâ subfastigiatâ, perianthii laciniis oblongis obtusis, staminibus perianthio æqualibus.

Hab. in Promontorio Bonæ Spei. Floret Julio.

Bulbus solitarius, rotundus, translucens vel hyalinus albus. *Caulis* strictissimus sesqui- v. bi-pedalis, teres, viridis, infra medium foliosus. *Folia* semipedalia, et ultra, glaucescentia, linearia, acuta, obscure carinata: marginibus sursum serrulato-ciliatis. *Vagina* teres, striata. *Spatha* univalvis, cornuta, caduca. *Umbella* laxa, subfastigiata, irregularis. *Pedicelli* $\frac{3}{4}$-unciæ longi, teretes, virides, squamis membranaceis intermixti. *Perianthium* album; laciniæ æquilongæ, oblongæ, obtusæ: carinis viridibus, exteriorum cum carinis aspero-setosis. *Stamina* perianthio æqualia. *Filamenta* dilatata, alba, alterna latiora tricuspidata: setis longissimis tortis. *Antheræ* oblongæ, luteæ: *polline* luteo. *Pistilla* staminibus multo breviora. *Ovarium* ovatum, viride. *Stylus* teres, albus. *Stigma* obtusiusculum. *Capsula* obtuse trigona: *loculis* 2-spermis.

OBS. This plant I met with in Mr COLVILL's nursery, where it had been received from the Cape of Good Hope, amongst some other bulbs.

18. *All. acutiflorum*, vaginis bicarinatis, spathâ univalvi deciduâ, umbellâ globosâ, perianthii laciniis lanceolatis acutis, staminibus conniventibus, perianthio brevioribus, marginibus ciliatis.

Allium acutiflorum Lois. Not. p. 55. Jour. Bot. ii. p. 279. Lam. et Dec. Fl. Fr. v. p. 316. No. 1952. Poir. Encyc. Suppl. p. 1255. Spreng. Sys. ii. p. 34.

Hab. in Gallia, &c. Floret Junio et Julio.

Bulbus ovato-rotundatus, gregarius, fusco-albus. *Caulis* teres, viridis, trifolius, 2-pedalis, crassitudine pennæ anserinæ. *Folia* lineari-lanceolata, apicem versus attenuata paulo torta, acuta, viridia: carina marginibusque sursum setoso-serrulatis interdum lævibus. *Vagina* striata, bicarinata, viridiuscula. *Spatha* univalvis, cornuta, caduca. *Umbella* globosa, confertiflora. *Pedicelli* teretes, rubescentes, semiunciam longi, squamis membranaceis rubris intermixti. *Perianthium* pallide rubrum semiapertum, post deflorationem atro-rubrum: laciniæ lanceolatæ, acutæ; exteriores carinâ fusco-rubrâ, setosâ. *Stamina* perianthio breviora. *Filamenta* conniventia, basi compresso-dilatata; marginibus ciliatis, alterna latiora longiora, tricuspidata: setis longioribus tortis. *Pistilla* staminibus breviora. *Capsula* obscure trigona, perianthio emarcido inclusa, trilocularis: *loculis* 1–2-spermis, sæpe uno abortivo.

OBS. This beautiful species I have seen no where but in the Chelsea Botanic Garden.

SECT. 2.—Foliis *carinatis lævibus.*

19. *All. Synnotii*, spathâ univalvi caducâ, umbellâ globosâ laxiflorâ, perianthii laciniis exterioribus ovatis asperocarinatis, interioribus oblongis obtusis, staminibus perianthio brevioribus.

Hab. in Promontorio Bonæ Spei. Floret Julio.

Simile A. erecto, sed marginibus carinisque foliorum lævibus nec setoso-serrulatis discrepans. *Bulbus* simplex. *Caulis* sesquipedalis, crassitudine pennæ corvinæ. *Perianthium* læte purpureum: laciniæ æquilongæ: lineolis dorsalibus fusco-rubris. *Filamenta* alba, alterna latiora tricuspidata. *Antheræ* luteæ. *Ovarium* ovatum, sexstriatum luteo-viride. *Stylus* brevis, albus.

Obs. This plant was brought home by Mr Synnot, from the Cape of Good Hope, in 1825, and flowered in 1826, as well as the following species.

20. *All. verrucosum*, spathâ univalvi caducâ, umbellâ multiflora subfastigiatâ, perianthii laciniis æquilongis, exterioribus ovatis oblongis acutis, verrucoso-carinatis, interioribus paulo latioribus, staminibus perianthium æquantibus.

Hab. in Promontorio Bonæ Spei. Floret Julio.

Simillimum præcedenti, sed perianthii laciniis acutis nec obtusis, et staminibus perianthium æquantibus nec illo brevioribus.

21. *All. multiflorum*, umbellâ rotundâ confertiflorâ, perianthii laciniis lanceolatis acutis, staminibus perianthio longioribus, spathâ sæpe 2-valvi deciduâ.

Allium multiflorum, Desf. Fl. Atl. i. p. 288. Poir. Encycl. Suppl. p. 266. Spreng. Sys. ii. p. 34.

Hab. in Algeria. Floret Julio et Augusto.

Bulbus ovatus, albus. *Caulis* teres, erectus, læviter striatus, 3-pedalis, infra medium foliosus. *Folia* linearia carinata, acuta, lævia. *Spatha* 2-valvis, rarius univalvis, decidua. *Umbella* globosa, confertiflora. *Pedunculi* breves, filiformes. *Perianthium* violaceum: laciniæ lanceolatæ, acutæ. *Stamina* perianthio longiora. *Filamenta* basi dilatata, alterna latiora tricuspidata: setis longissimis filamentosis tortis. *Pistilla* staminibus æqualia. *Capsula* obscure trigona: *loculis* 2-spermis.

Obs. This species is in habit like *Allium sphærocephalum*, but the leaves are flat and deeply keeled.

SECT. 3.—Foliis *angustis teretiusculis fistulosis.*

22. *All. descendens*, foliis supra canaliculatis, subtus sulcatis, marginibus ciliatis, spathâ univalvi caducâ, umbellâ conicâ conferta, perianthii laciniis linearibus obtusis, staminibus perianthio longioribus, capsulis trialatis, bulbo rotundo.

Allium descendens, Lin. Sp. Pl. 427. Reich. 2. 34. Mill. Dict. ed. Mart. i. No. 19. Lap. Fl. Pyr. abr. p. 180. Willd. Sp. Pl. ii. p. 71. Pers. Syn. i. p. 456. Poir. Encycl. Suppl. p. 266. Fl. Græc. t. 316. Prod. i. p. 224. Hort. Kew. ii. p. 235. Fl. Taur. Cauc. Suppl. p. 257. Willd. enum. i. p. 359.
A. sphærocephalum, var. β, Trev. All. No. 4.
A. staminibus alterne trifidis, foliis fistulosis, capite sphærico non bulbifero, atropurpureo, Hall. All. No. 11. Opusc. p. 355. cum icon. Monogr. No. 9.
A. caule subteretifolio umbellifero; pedunculis inferioribus brevioribus, staminibus tricuspidatis, Hort. Ups. p. 78.
Moly atropurpureum, Swert. Floret. t. 60. Morr. Hist. ii. sect. iv. cap. xvi. t. 16. f. 3. Rudb. Elys. ii. p. 165. f. 13.
Moly serotinum coniferum, Park. par. p. 145.

Hab. in Helvetia, Græcia, &c. Floret Junio et Julio.

Bulbus ovato-rotundatus, albus, solitarius. *Caulis* teres, lævis, erectus, gracilis, 3–4-pedalis, fere infra medium foliosus. *Folia* semiteretia, fistulosa, acutiuscula, subtus sulcata, supra canaliculata, marginibus ciliatis, fere pedem longa viridiuscula. *Vagina* teres, striata. *Spatha* univalvis, cornuta, caduca. *Umbella* conica, confertiflora. *Pedicelli* teretes, atropurpurei, inferiores breviores membranis intermixti. *Perianthium* parvum, atropurpureum, ante expansionem viride, superius præcoxius: *laciniæ* linearæ, obtusæ. *Stamina* inæqualia, perianthio multo longiora. *Filamenta* basi dilatata pallide rubra, ciliata, alterna latiora tricuspidata: *setis* longissimis albis tortis. *Antheræ* oblongæ, fuscæ: *polline* ochroleuco. *Pistilla* staminibus breviora. *Stylus* atropurpureus. *Stigma* album, obtusiusculum. *Capsula* trialata: *loculis* 1 rarius 2-spermibus.

OBS. The principal differences between this plant and the following, are, that the capsules of this are so deeply and acutely three-sided, as to appear three-winged; the flowers nearly black, and the leaves sulcated underneath, and ciliated at the margins: while those of the following have obtusely three-sided capsules, purple flowers, and the leaves not furrowed underneath, nor ciliated at their margins.

23. *All. sphærocephalum*, foliis lævibus supra canaliculatis, spathâ univalvi caducâ, nunc in 2-valvibus fissâ, persistente, umbellâ sphæricâ, perianthii laciniis, oblongis obtusis externis brevioribus, staminibus perianthio duplo longioribus, capsulâ obtuse trigona.

Allium sphærocephalum, Lin. Sp. Pl. 426. Reich. 2. 34. Poll. Pal. 328. Lam. Dict. i. p. 66. Suppl. p. 266. All. Pedm. No. 1872. Vill. Delp. ii. p. 255. Hofm. Germ. 116. Roth. Germ. i. p. 146; ii. p. 382. Bot. Mag. No. 1764. Lap. Fl. Pyr. abr. p. 179. Willd. Sp. Pl. ii. p. 70. Mill. Dict. ed. Mart. No. 16. Desf. Fl. Atl. i. p. 291. Brot. Fl. Lus. p. 542. Pers. Syn. i. p. 456. Lam. et Dec. Fl. Fr. iii. pt. 1. No. 1975. Bess. Fl. Galic. i. p. 232. Hort. Kew. ii. p. 235. Red. Liliac. vii. t. 319. Urvill. Lin. Trans. Paris. i. No. 310. Trev. All. No. 4. Spreng. Sys. ii. p. 34.
A. descendens, Bot. Mag. No. 251.
A. Veronense, Poll. Pl. Rar. p. 9. Spreng. Pug. Rar. ii. p. 60.
A. radice gemella, foliis fistulosis, capite sphærico, staminibus alterne trifidis, Hall. Helv. ii. p. 105. No. 1320.
A. staminibus alterne trifidis, foliis fistulosis, spica sphærica non bulbifera suaverubente, Hall. All. No. 10. Opusc. p. 353. Monogr. No. 8.
Scorodoprasum campestre juncifolium, capite rotundo compacto, floribus saturate et eleganter purpureis, cum tribus petalis externe verrucosis, Michel. Gen. p. 25.
S. montanum juncifolium, capite rotundo, dilute janthino, floribus paucis, Mich. Gen. p. 25. t. 25. f. 2.?
Allium sphærocephalon purpurascens, Raii, Hist. ii. p. 1118. No. 5.
A. sphærocephalon purpureum italicum, Bauh. Hist. ii. p. 563.

Hab. in Italia, Sibiria, Helvetia, Germania, Gallia, Lusitania, &c. Floret Julio et Augusto.

Bulbus geminus, ovatus, albus. *Caulis* teres, strictus, lævis, viridis, 2–3-pedalis, crassitudine pennæ corvinæ, infra medium foliosus. *Folia* linearia, teretiuscula, lævia, acuta, glaucescentia subfistulosa, supra canaliculata. *Vagina* teres, striata. *Spatha* univalvis, cornuta, caduca, nunc in 2-valvis fissa, persistens. *Umbella* conica, confertiflora. *Pedicelli* breves, crassi, fusci, inferiores breviores. *Perianthium* semiapertum, purpureum; laciniæ oblongæ, obtusæ, exteriores breviores acutiores, dorso verrucosæ, carinâ saturatiori. *Stamina* perianthio fere duplo longiora. *Filamenta* dilatata, compressa, basi alba, apice purpurea, alterna latiora, tricuspidata: setis longis purpureis tortis. *Antheræ* oblongæ, atro-purpureæ, effœtæ nigræ: *polline* ochroleuco. *Pistilla* staminibus æqualia. *Stylus* teres, purpureus. *Ovarium* ovatum, viride, sexstriatum, trigonum. *Capsula* obtuse trigona, trilocularis, sæpe uno abortivo: *loculis* 2-spermis.

Obs. This is a much more common plant than the preceding.

24. *All. pruinatum*, foliis filiformibus, spathâ univalvi caducâ, umbellâ subglobosâ, perianthii laciniis oblongis obtusis, staminibus perianthio brevioribus, stylo exserto.

Allium pruinatum, Link. et Spreng. Sys. ii. p. 35.

Hab. in Lusitania. Floret Julio et Augusto.

Bulbus rotundus, albus, solitarius. *Caulis* teres, pedalis et ultra, fere infra medium foliosus. *Folia* filiformia, teretia, fistulosa. *Spatha* univalvis, apice cornuta, caduca, nunc in 2 valvis fissa, persistens. *Umbella* globosa. *Perianthium* saturate purpureum: *laciniæ* oblongæ, obtusæ. *Stamina* perianthio breviora. *Filamenta* alterna latiora, tricuspidata. *Pistilla* staminibus longiora.

25. *All. carneum*, spathâ 2-valvi obtusâ diaphanâ, umbellâ subcapitatâ, perianthii laciniis oblongis acutis, staminibus perianthio brevioribus.

Allium carneum, Willd. Enum. i. p. 359. Spreng. Sys. ii. p. 35.

Hab. ?

Bulbus ovatus, albus. *Caulis* sesquipedalis, teres, inferne foliosus. *Folia* longa linearia, fistulosa. *Spatha* 2-valvis, obtusa, diaphana, rubicunda. *Umbella* subcapitata. *Perianthium* pallide purpureum: laciniæ ovato-oblongæ, acutæ, nervo medio viridi. *Stamina* perianthio breviora. *Filamenta* basi dilatata, alterna latiora, trifida.

26. *All. guttatum*, foliis semiteretibus, filiformibus, spathâ 2-valvi brevi, umbellâ effusâ multiflorâ, perianthii laciniis oblongis obtusis medio maculo nigro no tis, staminibus perianthio multo longioribus.

Allium guttatum, Steven. in Act. Soc. Nat. Curios. Mosc. ii. t. 11. f. 1. Link. Enum. i. p. 317. Urvill. in Mem. Lin. Soc. Paris. i. No. 311. Trev. All. No. 5. Spreng. Sys. ii. p. 34.
A. margaritaceum, Fl. Græc. t. 315. Prod. i. p. 224.

Hab. in Insulis Maris Ægii, Asia Minore, Tauria, Podolia, et prope Odessam, &c. Floret Julio et Augusto.

Bulbus subrotundus, simplex, fuscus. *Caulis* sesquipedalis, teres, tenuis, infra medium foliosus. *Folia* plerumque tria, setacea, teretia, canaliculata, glauca, scabra. *Spatha* 2-valvis, brevis. *Umbella* subrotunda, effusa, multiflora. *Pedicelli* filiformes, apice incrassati, exteriores deflexi; interiores erecti, longiores. *Perianthium* album: laciniæ oblongæ, obtusæ, concavæ, maculo magno purpureo centrali notatis, interiores angustiores. *Stamina* perianthio longiora. *Filamenta* alba, dilatata, alterna latiora, tricuspidata: *setis* longis tortis. *Pistilla* staminibus æqualia. *Capsula* trigona.

SECT. 4.—Caule *foliisque fistulosis teretibus.*

27. *All. Ascalonicum*, caule basi folioso, spathâ 2-valvi, umbellâ globosâ, perianthii laciniis ovato-lanceolatis, staminibus perianthio æqualibus, bulbis aggregatis.

Allium Ascalonicum, Lin. Sp. Pl. 429. Reich. ii. 37. Lam. Encycl. i. p. 70. Suppl. p. 268. Mill. Dict. ed. Mart. No. 27. Willd. Sp. Pl. ii. p. 75. Plenk. Icon. 258. Brot. Fl. Lus. p. 548. Pers. Syn. i. p. 457. Lam. et Decand. Fl. Fr. iii. pt. i. No. 1974. Willd. Enum. i. p. 360. Hort. Kew. ii. p. 236. Urvill. in Mem. Lin. Soc. Paris. i. No. 310. Spreng. Sys. ii. p. 34.
Cepa foliis subulatis, radicibus oblongis conglobosis, Hort. Cliff. p. 36. Hort. Ups. 79.
Cepa Ascalonica, Math. Opera, p. 420. Cam. Epit. p. 327. Hort. p. 170. Morr. Hist. ii. p. 383. sect. iv. t. 14. f. 4. Raii, Hist. p. 1117. No. 1. Mill. Dict. No. 4.
Cepa sterilis, Bauh. pin. 72. Trag. Hist. p. 732.
Ascalonides, Ger. emac.
Cepa Ascalonica sive fissilis, Bauh. Hist. ii. p. 551. Chab. Stirp. p. 200.
Ascalonides antiquorum, Lob. Adv. p. 58. icon. t. 153.
Scalogne absque flore, Math. Disc. p. 586.

Hab. in Syria, Asia Minore, Palestina. Floret Augusto.

Statura fere Allii schœnoprasii. *Bulbus* aggregatus; *tunicis* externis fuscis. *Caulis* subnudus, teres, fistulosus, spithamæus et ultra. *Folia* anguste teretia, fistulosa, acuta, lævia. Vaginæ purpurascentes. *Spa-*

tha 2-valvis. *Umbella* globosa. *Perianthium* Allii schænoprasii, sed minor et cœruleum: *laciniæ* ovato-lanceolatæ; lineolo dorsali saturatiore. *Stamina* perianthio æqualia. *Filamenta* dilatata, alterna latiora tricuspidata. *Antheræ* flavæ. *Stigma* obtusiusculum.

Var. β *majus.*
Cepa fissilis, Bauh. Pin. 72. Math. Opera, p. 420. Diosc. p. 585. Cam. Epit. p. 326. Hort. p. 170.
Cipolla fissile, Math. Disc. p. 585.

Var. γ *Chinense;* bulbis parvis, albidis, magnitudine nucis Avellanæ.
Allium Ascalonicum, Lour. Cochin. p. 202.

Obs. Var. α is called *Shallot.* Var. β, *Scallion;* and, according to Mr Milne, is cultivated extensively in Wales, under the name of *Hollow Leek;* and, according to De Candolle (see Fl. Fr.), under that of *Ciboull,* in France. These varieties are seldom or never to be met with in flower.

28. *All. junceum,* caule basi folioso, spathâ 2-valvi, umbellâ capitatâ, perianthii laciniis ovato-oblongis acutis, staminibus alternis quinquefidis, perianthio æqualibus.

Allium junceum, Fl. Græc. t. 322. Prod. i. p. 226. Spreng. Sys. ii. p. 35.

Hab. in Insula Cypro. Floret Julio et Augusto.

Bulbus aggregatus, ovatus, parvus; *tunicis* externis nigris. *Caulis* basi foliosus pedalis, teres, fistulosus. *Folia* cylindrica, acuta, fistulosa, saturate viridia. *Spatha* 2-valvis, concava, brevia. *Umbella* globosa, densa. *Pedicelli* breves. *Perianthium* purpureum: laciniæ ovato-oblongæ, acutæ, carinatæ. *Stamina* paululum exserta. *Filamenta* alba, alterna latiora quinquefida. *Antheræ* griseo-luteæ. *Ovarium* ovale. *Stylus* longitudine staminum. *Stigma* obtusiusculum.

Obs. This beautiful species closely resembles *All. Ascalonicum,* but is abundantly distinct, having each alternate stamen quinquefid.

29. *All. Cepa,* caule basi folioso inferne ventricoso, spa-

thâ 2- v. 4-lobâ reflexâ, umbellâ globosâ, perianthii laciniis oblongis obtusis cucullatis, dentibus brevibus obtusis, perianthio duplo longioribus, bulbo solitario depresso.

Allium cepa, Lin. Sp. Pl. 431. Reich. 2. 41. Lam. Encycl. i. p. 69. Suppl. p. 270. Mill. Dict. ed. Mart. No. 37. Desf. Fl. Atl. i. p. 291. Willd. Sp. Pl. ii. p. 80. Plenk. Icon. 255. Brot. Fl. Lus. p. 548. Lour. Cochin. p. 201. Thunb. Japon. p. 132. Pers. Syn. i. p. 457. Lam. et Dec. Fl. Fr. iii. pt. i. No. 1967. Fl. Græc. t. 326. Prod. i. p. 226. Willd. enum. i. p. 361. Hort. Kew. ii. p. 238. Trev. All. No. 6. Spreng. Sys. ii. p. 34.
A. esculentum, Salis. Hort. Chap. aller. p. 235.
A. staminibus alterne trifidis, caule ad terram ventricoso, Hall. All. No. 12. Opusc. p. 356. Monogr. No. 10.
A. scapo nudo inferne ventricoso longiore, foliis teretibus, Hort. Ups. 77. Mat. Med. 93.
Cepa scapo ventricoso, foliis longiore, radice depressa, Hort. Cliff. p. 137. Roy. Lugd. 40.
Cepa vulgaris et tunicis candidissimis, Bauh. Pin. 72. Mill. Dict. No. 3.
Cepa vulgaris, Bauh. Pin. 72. Morr. Hist. ii. sect. iv. cap. xiv. t. 14. f. 1. Rudb. Elys. ii. p. 141. Magn. Chart. p. 181.
Cepa vulgaris, floribus et tunicis purpurascentibus, Rupp. jen. ed. iii. p. 155.
Cepa, Trag. Hist. 736. Bauh. Phyt. p. 100. Fuch. Hist. 431. t. 430. Diosc. Lib. Secund. p. 270. Mat. Med. p. 231. Cam. Epit. p. 324. Lob. Obs. 73. Adv. 58.
Cepa capitata, Math. Valgr. 553. Opera, 419. Diosc. Lib. Secund. p. 271.
Cepæ, et Cepa rubra et alba, rotunda et longa, Bauh. Hist. ii. p. 547.
Cepa vel Cæpe, Chab. Stirp. 200.
Cipolla, Math. Disc. p. 583.
Cepa Hispanica oblonga, Park. Parad. 150.
Cepa oblonga, Dodon. Pempt. 687. Bauh. Pin. 72. Morr. Hist. sect. iv. p. 382. t. 14. f. 2. Mill. Dict. No. 4.

Hab. Floret Junio et Julio.

Bulbus rotundus, depressus, ovatus vel oblongus, albus vel ruber, solitarius. *Caulis* 1- v. 2-pedalis et ultra, fistulosus, basi foliosus. *Folia* disticha, glauca, lævia, acuta, fistulosa, caule breviora. *Spatha* 2–4-loba, reflexa, floribus inferioribus sæpe longior. *Umbella* sphærica, confertiflora, regularis. *Pedicelli* fere unciam longi, apice incrassati. *Perianthium* album, expansum: laciniæ oblongæ, obtusæ, mucronatæ, cucullatæ: lineola dorsali viridi. *Stamina* perianthio duplo longiora. *Filamenta* alba, alterna, basi dilatata trifida; appendicibus lateralibus brevibus, obtusis, dentiformibus. *Antheræ* oblongæ, luteo-virides: *polline* luteo. *Pistilla* staminibus multo breviora. *Ovarium* rotundum, album. *Stylus* teres, albus. *Stigma* obtusiusculum. *Capsula* rotunda, obtuse trigona: *loculis* 2-spermis.

Var. β *aggregatum*, bulbis rotundis, depressis, aggregatis, tunicis externis fuscis.

Var. γ *pauciflorum*, umbella pauciflora, perianthii laciniis ovatis acutis.

Allium cepa, var. pauciflorum, Trev. All. No. 6.

Var. δ *majus*, bulbo napiformi magni.

Allium napus, Pall. ined. ex Steud. Nomen.

Obs. There are numerous varieties of the Garden Onion, which differ principally in the shape and colour of their bulbs; some of these are noticed by ancient authors, which I have now quoted above. The two varieties I have enumerated are the most remarkable, and I have no doubt but, upon further examination, they may prove to be distinct species. Var. β, as far as I am acquainted, has never been seen in flower, although cultivated to some extent in culinary gardens, where it is called Underground or Potato Onion.

* * *

SCHŒNOPRASUM.

Divisio III.—*Umbella* capsulifera. *Stamina* simplicia subulata, nunc filiformia. *Spatha* 2-valvis brevis.

Sect. 1.—Scapis *subnudis foliisque fistulosis, cylindricis, staminibus subulatis perianthio dimidio brevioribus.*

30. *All. Schœnoprasum*, scapo foliis subæquali, spathâ 2-valvi brevi obtusâ mucronatâ, umbellâ globosâ congestâ, perianthii laciniis lanceolatis acutis.

Allium schœnoprasum, Lin. Sp. Pl. 432. Fl. Suec. ed. ii. p. 282. Knip. Cent. 8. No. 4. Reich. ii. p. 41. Lam. Dict. i. p. 70. Suppl. p. 267. Vill. Delp. ii. p. 259. Hoffm. Germ. p. 117. Roth. Germ. i. p. 147; ii. p. 386. Mill. Dict. ed. Mart. No. 40. Fl. Pyr. abr. p. 182. Eng. Bot. xxxiv. t. 2441. Pers. Syn. i. p. 358. Lightf. Scot. 160. Fl. Dan. t. 971. Lam. et Decand. Fl. Fr. iii. Brit. p. 360. Willd. Sp. Pl. ii. p. 81. Plenk. t. 257. Lap. Fl. pt. i. No. 1972. Willd. Enum. i. p. 362. Hort. Kew. ii. p. 239. Hook. Scot. p. 101. Spreng. Syst. ii. p. 39.

A. tenuifolium, Salisb. Hort. chap. aller. p. 235.

A. radice multiplici, foliis radicalibus, teretibus, scapi longitudine, floribus umbellatis, cylindricis, Hall. Helv. ii. p. 108. No. 1226.

A. staminibus simplicibus, foliis radicalibus, teretibus, scapi longitudine, Hall. All. No. 14. Opusc. p. 361. Monogr. No. 12.

Cepa scapi longitudine figuraque foliorum, foliis subulatis filiformibus, spathis globosis, Hort. Cliff. p. 136. Roy. Lugd. 40.

A. scapo nudo folia adæquante, foliis teretibus subulatis floriformibus, Hort. Ups. p. 78.

Cepa sectilis juncifolio perennis, Morr. Hist. ii. sect. iv. p. 383. t. 14. f. 5. Rand. Hort. Chel. p. 47. Mill. Dict. No. 5.

Cepa sectivum juncifolium, Bauh. Pin. 72. Rudb. Elys. ii. p. 143. f. 3. Rupp. Jen. p. 155.

Schœnoprasum, Dod. Pempt. 689. Tab. icon. 486. Lob. Adver. p. 58. Icon. 154. Ger. Emac. 176.

Porrum sectivum, et Schœnoprasum quibusdam, Bauh. Hist. ii. p. 553. Raii, Hist. ii. 1117. Chab. Stirp. p. 200.

Porrum sectivum, Trag. Hist. p. 742. Fush. Hist. p. 636. t. 635. Chab. Stirp. p. 200. Raii, Hist. p. 1117. No. 2. Diosc. lib. 2. p. 270.

Porrum sectile, Math. Valgr. i. p. 502. Bauh. Pin. 72. Cam. Epit. 322. Math. Opera, p. 417.

Cepa sectiva alias Porrum, Cup. Hort. Cathol.

Hab. in Anglia, Sibiria, Gallia, Germania, Helvetia, &c. Floret Maio et Junio.

Bulbus elongatus, aggregatus, albus. *Scapus* semipedalis, teres, striatus, glaucescens, foliis subæqualis, fistulosus. *Folia* fistulosa, glaucescentia, teretia, subulata, acuta, striata, basi in culmum connexa. *Vaginæ* teretes, striatæ. *Spatha* 2-valvis, brevis, valvis ovato-rotundatis, longitudine florum inferiorum. *Umbella* globosa, confertiflora. *Pedicelli* brevissimi, teretes. *Perianthium* rubrum, diaphanum, mediocre: laciniæ lanceolatæ, acutæ, carinâ fuscâ. *Stamina* perianthii dimidio breviora. *Filamenta* subulata, alba, semiteretia. *Antheræ* oblongæ, fuscæ. *Stylus* subulatus, albus, brevissimus. *Capsula* obtuse trigona: *loculis* dispermis, perianthio marcescenti rubro inclusa.

31. *All. foliosum*, scapo basi unifolio, foliis scapo bre-

vioribus, spathâ 2-valvi brevi mucronatâ, umbella subfastigiata laxiflorâ, perianthii laciniis oblongis acutis.

Allium foliosum, Red. Lilia, iv. t. 214. Spreng. Sys. ii. p. 39. Lam. Encycl. Suppl. p. 267.
A. schœnoprasum β alpinum, Lam. et Dec. Fl. Fr. iii. pt. i. p. 227. No. 1973.
A. acutum, Spreng. ex Steud. Nom.
A. glaucum, Desf. Hort. Par. ?
A. reflexum, Dietr. ex Steud.

Hab. in Gallia, Helvetia. Floret Maio et Junio.

Bulbus ovatus, elongatus, aggregatus, fuscescens. *Scapus* pedalis basi folio unico instructus. *Folia* teretia, fistulosa, striatula, viridiuscula, acuta, scapo breviora. *Vaginæ* teretes, fusco suffusæ. *Spatha* 2-valvis, ovato-rotundata, mucronata, purpurascens, fere longitudine pedunculorum inferiorum. *Pedicelli* teretes, purpurascentes; interiores ½-unciam longi, exteriores multo breviores. *Perianthium* mediocre purpureum: laciniæ oblongæ, acutæ: carinâ saturatiori. *Stamina* perianthii dimidio breviora. *Filamenta* subulata, alba. *Antheræ* oblongæ, rubræ, effœtæ nigræ: *polline* ochroleuco. *Pistilla* staminibus multo breviora, interdum æqualia. *Stylus* teres, albus. *Stigma* acutiusculum. *Capsula* obtuse trigona, trilocularis: *loculis* dispermis, perianthio marcescenti hyalino-purureo, persistente inclusa.

OBS. This is a much larger plant than *Allium schœnoprasum*, with a lax and fastigate umbel, and the stems, for the most part, bearing only one leaf at their bases.

32. *All. Sibiricum*, scapo basi unifolio foliisque sulcatis perglaucis, spathâ 2-valvi brevi, umbellâ conicâ, perianthii laciniis ovato-lanceolatis acutis.

Allium Sibiricum, Lin. Sys. 324. Reich. ii. p. 42. Mill. Dict. ed. Mart. No. 41. Lap. Fl. de Pyr. abr. p. 182. Willd. Sp. Pl. ii. p. 82. Pers. Syn. i. p. 358. Hort. Kew. ii. p. 239. Willd. Enum. p. 362. Spreng. Sys. ii. p. 39. Lam. Encycl. Suppl. p. 268.
A. schænoprasum, var. β, Lin. Sp. Pl. 433. Mur. Nov. Com. Goet. 1775, p. 33. t. 4. Bot. Mag. No. 1141. Hall. All. No. 14. Opusc. p. 364.
A. palustre, Salisb. Hort. chap. aller. p. 235.
A. roseum, Krock. Fl. Siles. No. 505. t. 43.
Cepa scapis foliisque teretibus, capitulis pyramidalis, Gmel. Sib. i. p. 59. t. xv. f. 1.
C. palustris altissima, Buxb. Cent. iv. p. 27. t. 45.

C. alpina palustris tenuifolia, Tour. Inst. p. 383.
Allium schœnoprasum, var. β alpinum, Wahlenb. ex Steud. Nomen.

Hab. in Sibiria. Floret Junio.

Bulbus ovato-oblongus, aggregatus, elongatus, albus. *Scapus* pedalis, cylindricus, sulcatus, glaucus, fistulosus, basi folio unico vaginatus, interdum nudus. *Folia* semiteretia vel teretia, fistulosa, sulcata, interdum supra canaliculata, acuta, glauca, scapo breviora. *Vaginæ* basi fuscæ. *Spatha* bivalvis: valvis scariosis, ovatis, longitudine pedunculorum inferiorum. *Umbella* conica, confertiflora. *Pedicelli interiores* semiunciam longi, *exteriores* multo breviores. *Perianthium* dilute purpureum, mediocre: laciniæ ovato-lanceolatæ, acutæ, apice paulo recurvæ, cum lineolo dorsali virescenti. *Stamina* perianthii dimidio breviora. *Filamenta* subulata, alba, alterna basi paulo latiora. *Antheræ* fuscæ, oblongæ, effœtæ nigræ: *polline* ochroleuco. *Pistilla* staminibus æqualia. *Ovarium* cinereum. *Stylus* teres. *Stigma* obtusum. *Capsula* trigona, perianthio marcescente hyalino-albo persistente inclusa: *loculis* dispermis.

OBS. This plant is about double the size of *Allium schœnoprasum*, and very glaucous. Umbels conical, crowded; flowers very pale-red; leaves often semicylindrical, and channelled above.

SECT. 2.—Caulibus foliisque *teretibus, fistulosis*; staminibus *longè exsertis*.

33. *All. fistulosum*, spathâ 2-valvi brevi, umbellâ sphæricâ, perianthii laciniis oblongis mucronatis, staminibus filiformibus, perianthio duplo longioribus, germine triquetro.

Allium fistulosum, Lin. Sp. Pl. 432. Reich. ii. p. 41. Mill. Dict. ed. Mart. No. 39. Thunb. Jap. p. 133. Willd. Sp. Pl. ii. p. 81. Plenk. icon. 259. Lam. Encycl. Suppl. p. 267. Pers. Syn. i. p. 358. Hort. Kew. ii. p. 239. Willd. Enum. i. p. 361. Spreng. Sys. ii. p. 39.
A. staminibus simplicibus, caule medio ventricoso, Hall. No. 13. Opusc. p. 360. Monogr. No. 11.
A. scapo nudo, folia adæquante, foliis teretibus ventricosis, Hort. Ups. 78.
Cepa scapo longitudine foliorum, foliis ventricosis, radice oblonga, Hort. Cliff. p. 136. Roy. Lugd. 40.

C. rupestris, radice turbinata dulci, Stell. Fl. jrc. 449. Gmel. Sib. i. p. 64.
C. plurium caulium, Bauh. Pin. 71.
C. sectilis, Cam. Epit. p. 325.
Cipolla sectile, Math. Disc. p. 584.

Hab. in Sibiria. Floret Junio et Julio.

Bulbus oblongus, aggregatus, albus. *Caulis* basi foliosus, cylindricus, fistulosus, inflatus, glaucescens, 2–3 pedalis. *Folia* cylindrica, fistulosa, inflata, acuta, glaucescentia. *Spatha* 2-valvis; valvis ovatis, mucronatis, longitudine pedunculorum inferiorum. *Umbella* sphærica, confertiflora. *Pedicelli* apice incrassati. *Perianthium* mediocre, luteoviride; laciniæ ovatæ, mucronatæ, hyalinæ, interdum apice sub microscopum minutissime laceratæ; interiores latiores carinis viridibus. *Stamina* perianthio duplo vel triplo longiora. *Filamenta* filiformia, albida, omnia basi membrano connexa. *Antheræ* oblongæ, luteæ; *polline* luteo. *Stylus* subulatus, albus. *Stigma* obtusiusculum. *Ovarium* viride, triquetrum. *Capsula* acute trigona; *loculis* dispermibus.

Var. *β majus* et *viridius.* Pedicelli breviores apice incrassati, triangulati.

Allium Altaicum, Pall. Itin. v. ii. No. 108. t. R.

Hab. in alpibus Altaicis. Floret Junio et Julio.

34. *All. cepæforme,* caule inferne ventricoso, spathâ 2 vel 4-lobâ, umbellâ globosâ, perianthii laciniis oblongis obtusis mucronatis cucullatis viridi-carinatis, staminibus subulatis alternis latioribus, perianthio duplo longioribus, bulbis aggregatis.

Hab. ? Floret Julio et Augusto.

Simillimum Allio Cepæ, sed staminibus simplicibus, nec basi trifidis, et bulbis magnitudine et forma Allii Ascalonici, differt.

Obs. This plant has lately been introduced into our gardens as a new sort of shallot; but it has no qualities to recommend it further than that it is more prolific than the old kind.

SECT. 3.—Caule *folioso;* foliis *planis;* staminibus *filiformibus longe exsertis.*

35. *All. obliquum*, foliis subtus carinatis, spathâ 2-valvi brevi, umbellâ globosâ, perianthii laciniis lanceolatis obtusis fornicatis apice crenulatis, staminibus filiformibus, perianthio triplo longioribus.

Allium obliquum, Lin. Sp. Pl. 424. Mill. Dict. No. 7. Knip. Cent. 9. No. 4. Reich. 2. 31. Bot. Mag. No. 1408. Lam. Encycl. i. p. 66. Suppl. p. 264. Mill. Dict. ed. Mart. No. 8. Willd. Sp. Pl. ii. p. 67. Pers. Syn. i. p. 355. Willd. Enum. i. p. 357. Hort. Kew. ii. p. 233. Red. Liliac. vii. cum icone. Spreng. Sys. ii. p. 37.
A. ramosum, Jacq. Icon. Rar. v. i. t. 62. Miss. ii. p. 308.
A. radice tunicata, foliis planis linearibus caulinis, capitulo umbellato, Gmel. Sib. i. p. 49. t. 9.

Hab. in Siberia. Floret Junio.

Bulbus ovatus, oblongatus, solitarius; tunicis externis fuscis. *Caulis* bipedalis, compressiusculus, crassitudine digiti minoris, infra medium foliosus. *Folia* subopposita, disticha lineari-lanceolata, glauca, apicem versus attenuata, obliqua, acuta, carinata, interdum convexa, pedalia, supra canaliculata. *Vaginæ* teretes, fusco-striatæ. *Spatha* 2-valvis: valvis ovatis, cucullatis, acuminatis, longitudine florum inferiorum. *Umbella* sphærica, confertiflora. *Pedicelli* filiformes, albi, $\frac{1}{4}$ unciæ longi, apice virentes. *Perianthium* parvum, flavum: laciniæ lanceolatæ, obtusæ, fornicatæ, concavæ, minutè laceratæ, exteriores paulo breviores. *Stamina* perianthio triplo longiora. *Filamenta* filiformia, alba, teretia. *Stylus* teres, albus. *Stigma* obtusiusculum. *Capsula* obtuse trigona: *loculis* dispermis.

36. *All. ramosum*, caule ramoso, foliis subtus convexis, spathâ 2-valvi brevi, umbellâ sphæricâ, perianthii laciniis lanceolatis obtusis fornicatis apice emarginatis, staminibus filiformibus perianthio triplo longioribus.

Hab. in Altaica. Floret Junio.

Bulbus ovatus, elongatus, solitarius; tunicis externis fuscis, obductus. *Caulis* 2-pedalis et ultra, basi compressiusculus, apice teres, glaucescens, crassitudine digiti minores, infra medium foliosus. *Folia* lineari-lanceolata, pedalia, plus minusve torta subtus convexa, subcarinata, sulcata, versus apicem attenuata, acuta, supra canaliculata. *Vaginæ* teretes, fusco-striati; ramis e vaginis teretibus, foliosis. *Spatha* 2-valvis, brevis. *Umbella* sphærica, confertiflora. *Pedicelli* filiformes, flavi, ½-unciam longi. *Perianthium* parvum, luteo-viride; laciniæ lanceolatæ, fornicatæ, obtusæ, apice emarginatæ sæpe paulo crenulatæ, exteriores paulo breviores. *Stamina* perianthio duplo vel triplo longiora. *Filamenta* filiformia, teretia, alba. *Antheræ* oblongæ, luteæ. *Pistilla* staminibus breviora. *Stylus* filiformis, albus. *Stigma* acutiusculum. *Capsula* obtuse trigona; loculis dispermis.

SECT. 4.—Caule *folioso;* foliis *semicylindricis;* staminibus *filiformibus longè exsertis.*

37. *All. angustum*, foliis angustis, linearibus subtus angulatis, umbellâ globosâ confertâ, perianthii laciniis oblongis obtusis externis minoribus.

Hab. in Siberia. Floret Junio et Julio.

Bulbus ovatus, elongatus; tunicis externis reticulatis, fuscis vestitus. *Caulis* 1- ad 2-pedalis, teres, infra medium foliosus. *Folia* anguste linearia semicylindrica, subtus angulata vel sulcata. *Spatha* 2-valvis, mucronata, brevis. *Umbella* globosa, confertiflora. *Pedicelli* tenues, semiunciam longi. *Perianthium* mediocre, purpureum; laciniæ oblongæ, obtusæ, externæ minores. *Stamina* perianthio duplo longiora. *Filamenta* subulata, filiformia, alterna, basi paulo latiora. *Antheræ* effœtæ, nigræ; polline ochroleuco. *Capsula* obtusè trigona; loculis dispermis.

Sect. 5.—Caule *inferne folioso; foliis semicylindricis;* staminibus *subulatis perianthio brevioribus vel æqualibus.*

38. *All. cærulescens,* foliis anguste linearibus, umbellâ globosâ, perianthii laciniis ovato-lanceolatis acutis stellatim expansis, staminibus basi dilatatis membranâ connexis perianthio brevioribus.

Allium cœruleum, Pallas, itin. ii. app. t. R. et in Herb. Lamb.

Hab. in Ruthenia. Pallas.

Bulbus rotundus, solitarius, tunicâ externâ fuscâ obductus. *Caulis* pedalis et sesquipedalis, teres, infra medium foliosus. *Folia* linearia angusta, semicylindrica. *Spatha* 2-valvis, brevis. *Umbella* globosa. *Pedicelli* filiformes, semiunciam longi. *Perianthium* parvum, cœrulescens, expansum, stellatum; laciniæ ovato-lanceolatæ, acutæ, lineolo dorsali saturatiore. *Filamenta* subulata, basi dilatata, alterna latiora basi membranâ connexa perianthio breviora. *Capsula* obtusè trigona: loculis trispermis.

39. *All. tenue,* foliis brevibus angustis semiteretibus, basi connatâ, umbellâ globosâ, perianthii laciniis oblongo-lanceolatis obtusiusculis, staminibus perianthio æqualibus.

Hab. in Ruthenia. Pallas.

Bulbus ovatus, solitarius, albus. *Caulis* pedalis et ultra, teres, inferne foliosus. *Folia* semiteretia, angusta, brevia. *Spatha* 2-valvis brevis, basi connata. *Umbella* globosa. *Pedicelli* filiformes, ¼ unciæ longi. *Perianthium* parvum, rubrum: laciniæ lineari-lanceolatæ, acutiusculæ. *Stamina* perianthio æqualia. *Filamenta* subulata, basi dilatata, alterna latiora. *Pistilla* staminibus longiora. *Stylus* teres. *Stigma* obtusiusculum.

Obs. The description of this plant, and the preceding, have been taken from specimens in the Herbarium of Professor Pallas, now in the possession of Mr Lambert.

40. *All. Pallasii*, caule basi folioso, foliis filiformibus subteretibus, umbellâ rotundâ multiflorâ, perianthii laciniis ovato-lanceolatis, staminibus perianthium æquantibus.

Allium Pallasii, Murr. Comm. Gœt. vi. 1775, p. 32. t. 3. Lin. Sys. 323. Mill. Dict. ed. Mart. No. 25. Willd. Sp. Pl. ii. p. 71. Pers. Syn. i. p. 356. Lam. Encycl. Suppl. p. 272. Spreng. Sys. ii. p. 39.

Hab. in Siberia.

Bulbus parvus, solitarius, rotundus, magnitudine nucis Avellanæ. *Caulis* teres, sesquipedalis, gracilis, basi foliosus. *Folia* semiteretia, longa, acuta, caule breviora, filiformia. *Vaginæ* teretes, violaceo-striatæ. *Spatha* 2-valvis, longitudine dimidii pedunculorum, ampliata, acuminata. *Umbella* rotundata, multiflora. *Pedicelli* unciam longi, supra incrassati, purpurei. *Perianthium* exiguum purpureum: laciniis ovato-lanceolatis, cum carino profunde coloratis. *Stamina* perianthio æquantia. *Filamenta* subulata, purpurea, alterna basi latiora. *Antheræ* oblongæ, fuscæ: polline ochroleuco. *Stylus* brevissimus. *Capsula* obtuse trigona.

Obs. This plant comes very near to the preceding.

41. *All. pusillum*, caule nano plerumque bifolio, foliis filiformibus semicylindricis, umbellâ multiflorâ, perianthii laciniis ellipticis truncatis integerrimis, staminibus perianthium æquantibus.

Allium pusillum, Cyr. Tenore, Cat. Pl. Hort. Neap. ad *a* 1813. p. 4. Spreng. Sys. ii. p. 39.
A. obtusiflorum, Poir. Dict. Suppl. i. p. 272. Red. Liliac. ii. t. 118.

Hab. in Italia. Floret Julio.

Planta minima. *Bulbus* subrotundus, solitarius. *Folia* in caule uno vel duo, illo breviora, filiformia, semiteretia, canaliculata, glaberrima. *Umbella* in planta spontanea, 8–12-flora, in culta 15–20-flora sphæroida. *Pedicelli* floribus parum longiores, demum pendulis. *Spatha* ovata, 2-valvis, longitudine umbellæ. *Perianthium* campanulatum, dilutissime purpurascens: laciniæ ellipticæ, truncatæ, integerrimæ; lineolis dorsalibus saturatioribus. *Stamina* perianthium æquantia. *Filamenta* subulata. *Antheræ* flavæ. *Stylus* brevissimus. *Ovarium* apice fuscescens.

Obs. This beautiful little species is the smallest of the genus, except *Allium chamæmoly*.

42. *All. rubellum*, caule plerumque 1- vel 2-folio, foliis filiformibus subteretibus canaliculatis, umbellâ fastigiatâ multiflorâ, staminibus subulatis perianthii dimidio brevioribus.

Allium rubellum, Fl. Taur. Cauc. i. p. 264. No. 655. Ejusd. Suppl. p. 260. Spreng. Sys. ii. p. 39. Lam. Encycl. Suppl. p. 272-3.

Hab. in Siberia, et Caucaso. Floret Julio et Augusto.

Bulbus subrotundus, solitarius, magnitudine nucis Avellanæ. *Caulis* teretiusculus. *Folia* in caule uno vel duo, filiformia, subteretia, canaliculata, carnosula. *Spatha* 2-valvis, brevis, persistens, (univalvis calyptriformis, cuspidata, decidua, ex cl. Fischero). *Umbella* multiflora, medio convexa. *Pedunculi* teretes, graciles, floribus multo longiores. *Perianthium* magnitudine Allii rotundi, dilute rosei: laciniæ erectiusculæ, acutæ. *Stamina* perianthio paulo breviora. *Filamenta* subulata, pallide rosea, alterna latiora. *Antheræ* oblongæ, badiæ. *Pistilla* staminibus multo breviora. *Ovarium* albido-virens. *Stylus* brevissimus, subulatus. *Stigma* obtusiusculum.

43. *All. reticulatum*, caule basi folioso, foliis semicylindricis linearibus obtusis, umbellâ fastigiatâ, perianthii laciniis ovato-oblongis acuminatis, staminibus subulatis perianthio multo brevioribus, bulbis reticulatis.

Allium reticulatum, Fraser Cat.
A. stellatum, var. β Bot. Mag. No. 1840.
A. angulosum, Pursh, Fl. Sept. Amer. i. p. 222.

Hab. in America Boreali. Floret Junio et Julio.

Bulbus conicus, tunicis fibroso-reticulatis vestitus. *Caulis* 6-uncias vel pedem altus, plerumque bifolius. *Folia* linearia, semicylindrica, scapo breviora. *Spatha* 2-valvis, fere longitudine pedunculorum. *Umbella* fastigiata, laxa. *Pedicelli* teretes, ½-unciam longi. *Perianthium* album, mediocre, expansum: laciniæ ovato-oblongæ, acuminatæ vel mucronatæ, intimæ angustiores et multo longiores; carinâ purpureâ. *Stamina* perianthio breviora. *Filamenta* basi dilatata, connexa, alterna latiora. *Pistilla* stamina æquantia. *Ovarium* sexstriatum, obtuse trigonum. *Stylus* teres. *Stigma* acutiusculum. *Capsula* obtuse trigona: loculis dispermis.

Var. β floribus roseis.

Obs. I am not certain whether this is the plant which Pursh mentions in his "Flora Septentrionalis Americanæ," under the name of *Allium angulosum*, but it is not unlikely. The flowers of his plant are white; but he copies the description of Willdenow, which does not agree with my plant.

MACROSPATHA.

Divisio IV.—*Umbella* bulbifera. *Stamina* subulata ad basin membranâ connexa. *Spatha* bicornis, elongata, foliacea. *Caulis* foliosus, ante anthesin tortus. *Flores* penduli, campanulati. *Capsulæ* erectæ.

Sect. 1.—Floribus *albidis, stamina æquantibus.*

44. *All. oxypetalum,* foliis linearibus, fistulosis subtus sulcatis, margine aspero, umbellâ effusâ; radiis pendulis, perianthii laciniis lanceolatis acuminatis.

Hab. in Europa australi. Floret Augusto.

Bulbus solitarius, ovatus, albus. *Caulis* sesqui- vel bipedalis, non exacte teres vel paulo compressiusculus, fusco suffusus, glaucescens. *Folia* anguste linearia, fistulosa, supra canaliculata subtus sulcata; margine aspero, tempore florendi marcescentia. *Vaginæ* teretes, striatæ. *Spatha* 2-valvis, basi ovata, apice elongata, foliacea. *Umbella* bulbifera, effusa, radiis pendulis. *Pedicelli* teretes, filiformes, 1- ad 2-uncias longi, basi albi, apicem versus virides, incrassati, sub florescentiâ curvati, demum erecti. *Perianthium* dilutissime purpurascens, fere album, campaniforme: *laciniæ* oblongo-lanceolatæ, acutæ v. acuminatæ, acumine interdum bifido: *lineolis* dorsalibus viridibus. *Stamina* perianthio breviora, sæpe æqualia. *Filamenta* subulata, alba, basi membranâ connexa. *Antheræ* oblongæ, luteæ; *polline* ochroleuco. *Pistilla* stamina æqualia. *Ovarium* luteum, trigonum. *Stylus* teres, albus. *Stigma* obtusiusculum. *Capsula* trigona, trilocularis: *loculis* 1- vel 2-spermis, intus hirtis.

Obs. This plant I met with in the Nursery of Messrs Loddiges at Hackney. It comes nearest to *Allium pallens*, but the umbels are bulbiferous, and the laciniæ of the perianth acuminate, which renders it easily distinguished from that species, in which the umbels are without bulbs, and the laciniæ of the perianth obtuse and truncate; indeed, this is the only species of this section with acuminate laciniæ of the perianth.

45. *All. intermedium*, foliis semiteretibus, supra canaliculatis, umbellâ pauciflorâ, perianthii laciniis brevibus truncatis.

Allium intermedium, Lam. et Decand. Fl. Fr. v. No. 1971.
A. paniculatum, Vill. Delph. ii. p. 354. Bart. Essai, p. 126. Lap. Fl. de Pyr. abr. p. 180.

Obs. In this species, according to Villars, the laciniæ of the perianth are scarcely divided to the middle, and the flowers white; but, according to Decandolle, they are red.

Sect. 2.—Floribus *luridis;* staminibus *perianthio æqualibus.*

46 *All. oleraceum*, foliis linearibus semiteretibus fistulosis, margine costisque aspere ciliatis, umbellâ effusâ, perianthio laciniis oblongo-lanceolatis obtusiusculis, tribus exterioribus truncatis.

Allium oleraceum, Lin. Sp. Pl. 429. Fl. Suec. 2. ed. p. 104. Gort. Ingr. p. 49. Vill. Delph. ii. p. 256. Lam. Encycl. i. p. 66. Suppl. p. 267. Schrad. Spic. Fl. Germ. p. 39. Hoffm. Germ. 117. Roth. Germ. i. p. 146; ii. p. 383. Mill. Dict. ed. Mart. No. 24. With. i. p. 344. Lap. Fl. de Pyr. abr. p. 181. Willd. Sp. Pl. ii. p. 74. Fl. Brit. 358. Eng. Bot. vii. t. 488. Pers. Syn. p. 357. Lam. et Decand. Fl. Fr. iii. pt. i. No. 1968. Willd. Enum. p. 359. Bess. Fl. Gall. i. p. 233. Hort. Kew. ii. p. 236. Hook. Scot. 101. Eng. Fl. ii. p. 136. Spreng. Sys. ii. p. 35.
A. virescens, Lam. et Dec. Fl. Fr. iii. p. 259.
A. virens, Lam. Encycl. i. p. 67.

A. parviflorum, Thuill. Fl. Paris. ii. p. 156.
A. bulbo simplici, foliis fistulosis, spatha bicorni, umbella bulbifera, Hall. Helv. ii. p. 107. No. 1223.
A. umbella bulbifera, vagina bicorni, foliis teretibus, Hall. All. No. 26. Opusc. p. 387. cum icone Monogr. No. 23.
A. sylvestre bicorne, flore obsoleto, Bauh. Pin. 74.
A. bicorne proliferum flore intus albescente, cum stria purpurascente externe, Bauh. Hist. ii. p. 160.
A. sylvestre bicorne flore viridi, Bauh. Hist. ii. p. 561. Chab. Stirp. p. 202.
A. caninum alterum, Trag. Hist. p. 748.
A. sylvestre bicorne flore ex herbaceo albicante, cum triplici in singulis petalis, stria atropurpurea, Raii Syn. 370. Hist. p. 1119. No. 3. Mill. Dict. No. 5.
A. montanum bicorne, flore ex albido, Bauh. Pin. p. 75. Morr. Hist. ii. p. 385. t. iv. f. 3.
A. montanum bicorne, floribus cinereis, Rudb. Elys. ii. p. 160. f. 18. Morr. Hist. ii. p. 385. sect. vi. t. 14. f. 3.
A. S. moly montanum tertium, Clus. Pann. p. 215. Hist. i. p. 193.
A. sylvestre alterum, Fush. Hist. p. 738.

Hab. in Anglia, Suecia, Germania, Helvetia, Gallia, &c. Floret Julio et Augusto.

Bulbus ovato-oblongus, albus vel læte fuscus, ex latere bulbillos generat. *Caulis* 2- v. 3-pedalis, crassitudine pennæ corvinæ, erectus, teres, versus vaginam fuscus, ante maturitatem contortus, infra medium foliosus. *Folia* anguste linearia, fistulosa, semicylindrica, subtus sulcata, marginibus costisque aspere ciliatis, supra subcanaliculata, apice obtusiuscula. *Vaginæ* teretes, striatæ. *Spatha* 2-valvis, longissima, elongata, foliacea, basi dilatata. *Umbella* bulbifera, effusa. *Pedicelli* pauci inæquales, 1- s. 2-uncias longi, fusci, vel virides, vel subflavescentes, filiformes: *bulbi* conferti, ovati, acuti, nigrescentes, basi viridiusculi. *Perianthium* pendulum, campaniforme luridum: *laciniæ* oblongo-lanceolatæ, obtusiusculæ, flavo-virides, tribus striis vel pluribus purpureis notatæ, tres exteriores truncatæ. *Stamina* perianthium æquantia. *Filamenta* subulata, albida, basi membranâ connexa. *Antheræ* oblongæ, luteæ; *polline* ochroleuco. *Pistilla* staminibus æqualia, sæpe breviora. *Ovarium* oblongum, luteum. *Stylus* teres, albus. *Stigma* obtusiusculum.

Obs. This plant approaches near to the following; but the leaves being fistulose, and the back ribbed, with the margins and the ribs setosely ciliated, and with the alternate laciniæ of the perianth truncate, are characters sufficient to distinguish it from the *Allium carinatum*.

47. *All. carinatum*, foliis anguste linearibus obtusis carnosulis planiusculis subtus striatis obscure carinatis, umbellâ effusâ, perianthii laciniis oblongis obtusis (cum mucrone brevi).

Allium carinatum, Lin. Sp. Pl. 426. Fl. Suec. ed. 2. No. 281. Scop. Fl. Carn. i. p. 236. No. 39. Mill. Dict. No. 11. Reich. ii. 33. Pol. Pal. No. 327. Huds. Angl. p. 136. Lam. Encyc. i. p. 66. Suppl. p. 266. Vill. Delph. ii. p. 253. Hoffm. Germ. 116. Roth. Germ. i. p. 146; ii. p. 382. Schrad. Spic. Fl. Germ. ii. p. 84. Mill. Dict. ed. Mart. No. 15. Lap. Fl. de Pyr. abr. 178. Willd. Sp. Pl. ii. p. 70. Fl. Brit. 357. Engl. Bot. xxiv. t. 1658. Pers. Syn. i. p. 356. Lam. et Dec. Fl. Fr. iii. pt. i. No. 1954. Willd. Enum. i. p. 358. Hort. Kew. ii. p. 234. Hook. Scot. 101. Eng. Fl. ii. p. 135. Spreng. Sys. ii. p. 35.
A. bulbo sobolifero, foliis succulentis, spatha bicorni, umbella bulbifera, Hall. Helv. ii. No. 1224. p. 107.
A. inodorum, umbella bulbifera, vagina bicorni, foliis carinatis, Hall. All. No. 27. Opusc. p. 391. cum icone. Monogr. No. 24.
A. montanum bicorne, angustifolium, flore purpurascente, Rudb. Elys. p. 155.
A. sylvestre, bulbiferum, angustifolium, Rupp. Jen. 2d ed. p. 122.
A. montanum, flore obsoletiore, Bauh. Pin. 75. Morr. Hist. ii. p. 385. sect. xiv. t. 14. f. 3.
A. montanum bicorne purpureum proliferum, Raii Syn. p. 369. Hist. ii. p. 1119. No. 2. Bauh. Hist. ii. p. 561.
Moly lurido colore, Swert. Florel. t. 61.
M. montanum secundum, Clus. Hist. p. 193. f. 2. Pann. t. 214. Ger. emac. 187.
Porrum sylvestre inodorum, Bauh. Pin. 72.
Ampeloprasum proliferum, Lob. Icon. p. 156.
Ampeloprasum, Cam. Epit. 323. Raii Hist. p. 1127. Cam. Hort. p. 170. Math. Opus. 418. Park. Theat. 871.
Ampeloprasum, sive Porrum sylvestre, Ger. Emac. 176.

Hab. in Anglia, Germania, Gallia, Carniola, Helvetia, &c. Floret Julio et Augusto.

Bulbus ovato-rotundatus, pallidus. *Caulis* lævis, teres, paulo striatulus, 2- v. 3-pedalis, crassitudine pennæ corvinæ, infra medium foliosus, ante maturitatem contortus. *Folia* anguste linearia, obtusa, carnosula, subtus convexa, obscure carinata, supra canaliculata, planiuscula; marginibus scabris. *Vaginæ* teretes, striatæ. *Spatha* 2-valvis, longissime producta, foliacea, basi dilatata. *Umbella* effusa; *bulbillis* confertis oblongis, apice nigrescentibus, basi viridiusculis, acutis. *Pedicelli* pauci, filiformes, teretes, viridi-glaucescentes, 1 sive 2 uncias longi. *Perianthium* pendulum, luridum, campaniforme: *laciniæ* oblongæ, obtusæ, cum acumine brevi, viridi-flavescentes, atro-fusco suffusæ, cum lineolo dorsali viridi. *Stamina* perianthium æquantia. *Filamenta* subulata, fusco-albida, basi membranâ connexa, tribus præcocioribus. *Antheræ* oblongæ, luteæ. *Pistilla* staminibus æqualia. *Ovarium* oblongum, luteum, sexstriatum. *Stylus* teres, flavescenti-albidus. *Stigma* obtusiusculum.

Obs. It is extremely difficult to ascertain the old synonyms of this plant from *Allium oleraceum.*

Sect. 3.—Floribus *violaceis ;* staminibus *longe exsertis.*

48. *All. flexum*, foliis angustissimis semicylindricis supra canaliculatis, marginibus ciliatis, umbellâ effusâ multiflorâ, perianthii laciniis oblongis truncatis cucullatis.

Allium fœtidum, Willd. Enum. Suppl. p. 17. Link. Enum. p. 318.

Hab. in Siberia. Floret Julio et Augusto.

Bulbus ovatus, magnitudine A. Ascalonici, purpureo-suffusus, duos caules ferens. *Caulis* foliosus, non exacte teres, crassitudine pennæ corvinæ, viridis, lævis, subflexuosus, ante maturitatem tortus, pedalis et ultra. *Folia* plerumque tria, filiformia, semicylindrica, supra canaliculata, subtus convexa, striatula, lævia; imo duos caules vaginantia, medio supra convexo, superiore in formam superioris, longitudine caulis, omnibus marginibus aspere ciliatis. *Spatha* 2-valvis, longissime elongata, foliacea. *Umbella* bulbifera, multiflora; bulbis ovatis, acuminatis, viridibus, conferta. *Pedicelli* teretes, purpureo-glaucescentes, apice incrassati viridi-nigrescentes, fere unciam longi. *Perianthium* mediocre, pendulum, truncatum, atropurpureum: *laciniæ* æquales, oblongæ, truncatæ vel cuneatæ, cucullatæ, cum lineolis dorsalibus saturatioribus. *Stamina* perianthio duplo longiora. *Filamenta* teretia, pallide rubra, subulata. *Antheræ* oblongæ, nigrescentes: *polline* ochroleuco. *Pistilla* staminibus æqualia, sæpe longiora. *Ovarium* oblongum, viride. *Stylus* teres, subulatus, purpureus, apice albus. *Stigma* obtusiusculum vel acutiusculum.

Obs. This beautiful species deserves a place in every garden: its numerous purple flowers and peduncles have a fine effect.

49. *All. violaceum*, foliis planiusculis obtusis subglaucescentibus supra canaliculatis, subtus striatis, margine scabro, umbellâ pauciflorâ, perianthii laciniis oblongis cucullatis truncatis.

Allium violaceum, Willd. Enum. Suppl. p. 17. Link. Enum. p. 318.
A. flexum, Walds. et Kit. Pl. rar. Hung. iii. t. 278. Spreng. Sys. ii. p. 35.

Hab. in Hungaria. Floret Julio et Augusto.

Bulbus ovatus, albus, purpureo suffusus, gregarius. *Caulis* teres, lævis, viridis, infra medium foliosus, ante maturitatem tortus, pedalis et ultra. *Folia* brevia, linearia, lævia, planiuscula, supra canaliculata, subtus subconvexa, striata, margine sub microscopo ciliata. *Vaginæ* teretes, striatæ. *Spatha* 2-valvis, longissima, foliacea. *Umbella* effusa, pauciflora; *bulbillis* ovatis, acutis, fusco suffusis, conferta. *Pedicelli* teretes, rubro-flavescentes, subfarinosæ, unciam longi. *Perianthium* mediocre, atropurpureum, campaniforme: *laciniæ* oblongæ, cucullatæ, truncatæ vel emarginatæ; apice margine albo instructo, cum lineolis dorsalibus saturatioribus. *Stamina* perianthium duplo superantia. *Filamenta* purpurascentia, teretia, subulata. *Antheræ* oblongæ, nigræ; *polline* ochroleuco. *Pistilla* stamina æquantia. *Ovarium* oblongum, viride. *Stylus* subulatus, teres, purpurascens, apice albus. *Stigma* obtusiusculum v. acutiusculum.

Var. β *minus*, foliis dorso striatulis, lævibus.

50. *All. asperum*, foliis anguste linearibus supra canaliculatis subtus sulcatis, marginibus costisque aspere ciliatis, umbellâ pauciflorâ, perianthii laciniis oblongis truncatis.

Allium carinatum, Red. Liliac. vii. t. 368. Link. Enum. i. p. 318.

Hab. in Europa australi. Floret Julio et Septembro.

Bulbus ovatus, albus, solitarius. *Caulis* teres, glaucescens, rigidus, pedalis et ultra, crassitudine pennæ corvinæ, ante maturitatem flexus. *Folia* anguste linearia, supra canaliculata, subtus convexa, sulcata; marginibus costisque aspere ciliatis. *Spatha* 2-valvis, longissime producta, foliacea, basi dilatata. *Umbella* bulbifera, pauciflora, teretia, monstrosa; *bulbis* ovatis, acuminatis, viridibus, interdum angulatis, conferta. *Pedicelli* pauci, semiunciam sive unciam longi, violacei, glaucescentes, apice incrassati. *Perianthium* mediocre, violaceum, pendulum, truncatum: *laciniæ* oblongæ, truncatæ, cucullatæ, ad apicem margine albo, lineolis dorsalibus saturatioribus carinatæ. *Stamina* perianthium duplo superantia. *Filamenta* purpurea, teretia, subulata, apice alba. *Antheræ* oblongæ, purpureæ; *polline* ochroleuco. *Pistilla* stamina æquantia. *Ovarium* obovatum, viride. *Stylus* teres, purpureus. *Stigma*, album, obtusiusculum.

Divisio V.—*Umbella* capsulifera. *Stamina* subulata, basi membranâ connexa. *Spatha* bicornis, elongata, foliacea. *Caulis* foliosus, ante anthesin flexus. *Flores* penduli, campanulati. *Capsulæ* erectæ.

Sect. 1.—Floribus *luridis* ; staminibus *perianthio æqualibus*.

51. *All. longispathum*, foliis anguste linearibus subteretibus, margine scabris, umbella multiflorâ effusâ, perianthii laciniis oblongis truncatis cum mucrone.

Allium longispathum, Red. Liliac. vi. t. 316.
A. fuscum, Walds. et Kit. Pl. Rar. iii. t. 241.
A. pallens, Bot. Mag. No. 1420. Fl. Græc. t. 317. Prod. i. p. 224.
A. paniculatum, Fl. Græc. t. 318. Prod. i. p. 225. Fl. Taur. Cauc. i. p. 264. No. 653.
A. sylvestre bicorne, floribus sandrecharum, Cup. Hort. Cath.

Hab. in Hungaria, et Europa australi. Floret Augusto.

Bulbus ovato-rotundatus, albus, fusco suffusus, solitarius. *Caulis* teres, sesquipedalis, fusco-glaucescens, ante maturitatem flexus, infra medium foliosus. *Folia* anguste linearia, obtusa, semiteretia, supra canaliculata, subtus convexa, striatula, pedalia et ultra, fistulosa, margine setoso-ciliata. *Vaginæ* teretes, striatæ. *Spatha* 2-valvis, uno breviore quam altero, pedem vel sesquipedem longa. *Umbella* multiflora, effusa. *Pedicelli* teretes, filiformes, semiunciam v. sesquiunciam longi, viridi-fusci. *Perianthium* mediocre, luridum, campaniforme, ante expansionem viride, demum purpurascens: *laciniæ* oblongæ, truncatæ, cum mucrone brevi, flavescentes, purpureo suffusæ, lineolis dorsalibus fusco-viridibus carinatæ. *Stamina* perianthium subæquantia, interdum paulo excedentia. *Filamenta* subulata, alba, basi membranâ connexa, plana. *Antheræ* oblongæ, luteæ; *polline* ochroleuco. *Pistilla* stamina æquantia, sæpe paulo superantia. *Ovarium* oblongum, flavum, basi apiceque viridibus. *Stylus* teres, albus. *Stigma* obtusiusculum. *Capsula* obtuse trigona: *loculis* dispermis.

Obs. This plant bears much resemblance to *Allium ole-*

raceum and *carinatum;* but the umbels being without bulbs, and having exceeding long spaths, is sufficient to distinguish it from those species.

SECT. 2.—Floribus *albidis vel roseis,* stamina *æquantibus.*

52. *All. paniculatum,* foliis subteretibus lævibus supra canaliculatis obtusis subfistulosis glaucis, umbellâ effusâ, perianthii laciniis lanceolatis truncatis.

Allium paniculatum, Lin. Sp. Pl. 428. Reich. ii. p. 36. Fl. Carn. p. 237. 2d ed. p. 318. No. 398. Lam. Encyc. i. p. 67. Suppl. p. 267. Gært. Fruct. i. p. 56. t. 16. Vill. Delph. ii. p. 254. Bot. Mag. No. 1432. Mill. Dict. ed. Mart. No. 22. Lap. Fl. de Pyr. abr. p. 180. Desf. Fl. Atl. i. p. 289. Willd. Sp. Pl. ii. p. 73. Brot. Fl. Lusit. p. 545. Hoffm. Fl. Germ. p. 116. Pers. Syn. i. p. 256. Bess. Fl. Galic. i. p. 232. Hort. Kew. ii. Urvill. in Mem. Soc. Lin. Paris. i. No. 315. Trev. All. No. 25. Spreng. Sys. ii. p. 38.

A. radice duplici, foliis succulentis, spatha bicorni, umbella radiis pendulis, Hall. Helv. ii. p. 108. No. 1225.

A. foliis teretibus, vagina bicorni, umbella pendula suavepurpurea, Hall. All. No. 25. Opusc. p. 386. cum icone. Monogr. No. 22. Mich. Gen. t. 24. f. 4.

A. montanum bicorne, floribus triquetris purpureis, pedunculis longis et reflexis, Seguier. ii. p. 70.

A. montanum quartum. Species 2. Clus. Pann. t. 218. Hist. p. 194.

Hab. in Gallia, Austria, Sibiria, Helvetia, Italia, Carniola, Græcia, Lusitania, Germania. Floret Julio.

Bulbus ovatus, albus, solitarius. *Caulis* teres, 1- v. 2-pedalis, erectus, nunc flexuosus, lævis, infra medium foliosus. *Folia* anguste linearia, subteretia, obtusa, lævia, glauca, supra canaliculata, subtus convexa, striata. *Vaginæ* purpureo-striatæ. *Spatha* bivalvis, longissima, foliacea, basi nervis prominentibus. *Umbella* effusa, laxa, multiflora. *Pedicelli* teretes, filiformes, fuscescentes, a ½ ad unciam longi. *Perianthium* purpurascens, mediocre, pendulum truncatum, post deflorationem erectum: *laciniæ* oblongæ, truncatæ, lineolis dorsalibus viridibus carinatæ. *Stamina* perianthium æquantia. *Filamenta* subulata, alba, plana, basi membranâ connexa. *Antheræ* luteæ: *polline* ochroleuco. *Pistilla* staminibus breviora, sæpe brevissima. *Ovarium* oblongum, luteum. *Stylus* teres, albus. *Stigma* obtusiusculum. *Capsula* obovata, obtuse trigona: *loculis* 1–2-spermis.

53. *All. pilosum*, foliis semicylindricis vaginisque pilosissimis, umbellâ subfastigiatâ, perianthii laciniis oblongis obtusis, staminibus subulatis.

Allium pilosum, Fl. Græc. t. 321. Prod. i. p. 225. Spreng. Sys. ii. p. 40.

Hab. in Græcia.

Bulbus globosus, albus. *Caulis* subflexuosus, spithameus, teres, glaber, foliosus. *Folia* patentia, semicylindrica, apice attenuata, pilosa. *Vaginæ* teretes, pilosissimæ; pilis longis, rigidulis, albis. *Spatha* bivalvis, elongata, foliacea. *Umbella* subfastigiata, multiflora. *Perianthium* incarnatum, campaniforme, exterius nutans: *laciniæ* oblongæ, obtusæ; nervo medio saturatiore. *Stamina* perianthio æqualia. *Filamenta* subulata, rosea. *Antheræ* luteæ. *Ovarium* viride. *Stylus* teres, roseus.

54. *All. pallens*, foliis semicylindricis, supra canaliculatis, subtus sulcatis, margine aspero, subfistulosis, umbellâ multiflorâ effusâ, perianthii laciniis oblongis obtusis alternis truncatis.

Allium pallens, Lin. Sp. Pl. 427. Scop. Fl. Carn. i. p. 337. Gouan. Illus. 24. Lap. Fl. Pyr. abr. p. 180. Lam. Encycl. i. p. 67. Suppl. p. 357. Desf. Fl. Atl. i. p. 290. Willd. Sp. Pl. ii. p. 72. Brot. Fl. Lusit. p. 542. Pers. Syn. i. p. 356. Hort. Kew. ii. t. 235. Red. Liliac. v. t. 272. Trev. All. No. 24.
A. montanum bicorne, flore pallido odoro, Bauh. Pin. 75. Raii Hist. 1118. No. 8. Morr. ii. p. 386. sect. 14. f. 4.
Gethcoides sylvestre, Columm. Ecphr. ii. p. 6. t. 7. f. 2.

Hab. in Europa australi. Floret Julio et Augusto.

Bulbus ovatus, albus, solitarius. *Caulis* non exacte teres, infra medium foliosus, crassitudine pennæ corvinæ, vel interdum anserinæ, pedalis v. bipedalis. *Folia* brevia, semicylindrica, supra canaliculata, subtus convexa, sulcata, margine aspero, glauca, apice obtusa. *Spatha* bivalvis, longissima, foliacea, basi ovata, striata. *Umbella* effusa, multiflora. *Pedicelli* filiformes, rubescentes, plerumque unciam longi. *Perianthium* campaniforme, albidum, pendulum, post anthesin erectum: *laciniæ* oblongæ, obtusæ, alternè truncatæ, lineolis dorsalibus viridibus carinatæ. *Stamina* perianthium æquantia. *Filamenta* subulata, alba, basi membranâ connexa. *Antheræ* oblongæ, pallide luteæ: *polline* ochroleuco. *Pistilla* staminibus breviora. *Ovarium* oblongum, luteum. *Stylus* teres, albus, interdum brevissimus. *Stigma* obtusiusculum. *Capsula* obtuse trigona: *loculis* 1-vel 2-spermis.

Obs. The *Allium pallens* differs from *Allium paniculatum* in having the flowers much shorter and whiter, and the alternate laciniæ of the perianth truncate. The base of the spaths are ovate, while those in *Allium paniculatum* are narrow and lanceolate.

Sect. 3.—Floribus *roseis*, staminibus *brevioribus*.

55. *All. tenuiflorum*, caule inferne folioso, foliis semiteretibus supra canaliculatis, umbellâ effusâ multiflorâ, perianthii laciniis linearibus obtusis, apice revolutis.

Allium tenuiflorum, Fer. Fl. Neap. i. p. 165. t. 30. Prod. p. 22.

Hab. in Italia. Floret Julio.

Bulbus ovatus, albus. *Caulis* pedalis, teres, inferne bifolius. *Folia* semicylindrica, supra canaliculata, subtus convexa, longitudine caulis. *Spatha* bivalvis, longissime producta, foliacea. *Umbella* effusa, multiflora. *Pedicelli* filiformi, unciam longi. *Perianthium* pendulum, roseum, campaniforme, post florescentiam erectum: *laciniæ* lanceolatæ, obtusæ, lineolis dorsalibus saturatioribus, carinatæ. *Stamina* perianthio multo breviora. *Filamenta* subulata, lutescentia. *Antheræ* oblongæ, luteæ. *Pistilla* stamina superantia, interdum æquantia. *Ovarium* viride, obtuse trigonum. *Stylus* subulatus. *Stigma* obtusiusculum.

Sect. 4.—Floribus *violaceis*; staminibus *longe exsertis*.

56. *All. pulchellum*, foliis semicylindricis subtus sulcatis margine costisque ciliatis, umbellâ effusâ, perianthii laciniis oblongis truncatis.

Allium paniculatum, Red. Liliac. v. t. 252. Lam. et Decand. Fl. Fr. v. No. 1972. Hornem. Hafn.
A. coloratum, Spreng. Sys. ii. p. 38.
A. Nitschmanniani, Willd. Herb. ex Trev. All. p. 15.

A. Seguierianum, ex Trev. All. p. 15.
A. flavum, var. β, Fl. Taur. Caucas. Suppl. p. 258.

Hab. in Rossia. Pallas. Floret Augusto.

Bulbus ovatus, albus. *Caulis* teres, lævis, viridis, pedalis, infra medium foliosus, ante anthesin flexus. *Folia* angusta, semicylindrica, 7 vel 8 uncias longa, supra canaliculata, subtus convexa, sulcata; marginibus costisque setoso-ciliatis. *Vaginæ* teretes, luteo-striatæ. *Spatha* 2-valvis, longissima, foliacea, interdum 4 uncias longa. *Umbella* effusa, multiflora. *Pedunculi* purpurei, glaucescentes, filiformes, apice incrassati, 1 ad 2 uncias longi. *Perianthium* violaceum, truncatum, pendulum, post deflorationem erectum: *laciniæ* oblongæ, truncatæ, cucullatæ, glaucescentes; linea dorsali saturatiore. *Stamina* perianthium duplo superantia. *Filamenta* teretia, filiformia, basi apiceque alba, medio purpureo, membranâ basi connexa. *Antheræ* purpurea, effœtæ nigræ: *polline* ochroleuco. *Pistilla* stamina æquantia, interdum paulo superantia. *Ovarium* oblongum, viride, sexstriatum. *Stylus* teres, purpureus, apice albus. *Stigma* obtusiusculum. *Capsula* acute trigona, trilocularis: *loculis* dispermis.

OBS. This plant approaches near to *Allium flexum*, but the umbels are without bulbs, and is, as well as that species, a very ornamental plant.

SECT. 5.—Floribus *luteis;* staminibus *longe exsertis.*

57. *All. flavum*, caule folioso, foliis teretibus filiformibus, spathâ 2-valvi elongatâ, umbellâ effusâ, perianthii laciniis oblongis truncatis, staminibus filiformibus perianthio duplo longioribus.

Allium flavum, Lin. Sp. Pl. 428. Reich. 2. 35. Jacq. Aust. ii. p. 25. t. 141. Lam. Dict. i. p. 67. Suppl. p. 267. Vill. Delp. ii. p. 257. Bot. Mag. No. 1330. Mill. Dict. ed. Mart. No. 20. Lap. Fl. de Pyr. abr. p. 180. Willd. Sp. Pl. ii. p. 72. Pers. Syn. i. p. 356. Lam. et Dec. Fl. Fr. iii. pt. i. No. 1970. Fl. Græc. Prod. i. p. 224. Fl. Taur. Cauc. i. p. 263. No. 652. Willd. enum. i. p. 359. Hort. Kew. ii. p. 235. Red. Liliac. ii. t. 119. Fl. Taur. Cauc. Suppl. p. 258. Urvill. Lin. Trans. Paris. i. No. 316. Spreng. Sys. ii. p. 39.
A. flavum, var. α, Lam. et Dec. Fl. Fr. iii. p. 258.
A. foliis teretibus, vagina bicorni umbella lutea pendula, Hall. All. No. 25. Opusc. p. 385. Monogr. No. 21.
A. junciforme, bicorne luteum, Bauh. Pin. 75. Rudb. Elys. ii. p. 157. f. 6. Morr. ii. p. 386.

A. flore luteo seu pallido, Bauh. Hist. ii. p. 561. Raii, Hist. ii. p. 1118. No. 6.
A. seu moly montanum quartum, species primum, Cluss. Hist. p. 194. Ger. emac. p. 138. Cluss. Pann. t. 217.
A. sylvestre, flore luteo subpallido, Chab. Stirp. p. 202.

Hab. in Austria, Gallia, Græcia, &c. Floret Junio et Julio.

Bulbus ovatus, solitarius: *tunicis* fuscescentibus, vestitus. *Caulis* teres, tenuis, erectus, pedalem ad sesquipedalem altus, infra medium foliosus, ante maturitatem flexus. *Folia* gracilia, filiformia, teretiuscula, caule breviora. *Vaginæ* teretes, striatæ, ante anthesin semper emarcidæ. *Spatha* bivalvis, elongata, foliacea, 3 ad 4 uncias longa, reflexa. *Umbella* laxa, effusa. *Pedicelli* filiformes, plerumque unciam longi, sub anthesin curvati, post deflorationem erecti. *Perianthium* truncatum, pendulum, luteum: *laciniæ* oblongæ, truncatæ, concavæ, lineolis dorsalibus viridibus. *Stamina* perianthium duplo superantia. *Filamenta* pallida, filiformia, teretia. *Antheræ* gravidæ, luteæ. *Pistilla* staminibus fere æqualia. *Capsula* obtuse trigona: *loculis* dispermis.

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Divisio VI.—*Umbella* capsulifera. *Stamina* subulata, basi membrano angustissimo connexa. *Spatha* bicornis elongata foliacea vel apice mucrone brevi foliaceo. *Caulis* inferne foliaceus, ante anthesin tortus. *Flores* erecti.

Sect. 1.—Floribus *roseis*; staminibus *exsertis.*

58. *All. Caucasicum*, foliis filiformibus semicylindricis supra canaliculatis, subtus asperè striatis, spathâ 2-valvi elongatâ, umbellâ globosâ laxâ, perianthii laciniis ovato-lanceolatis acutis.

Allium Caucasicum, Fl. Taur. Cauc. Suppl. p. 258. Lam. Encycl. Suppl. p. 273.
A. globosum, Red. Liliac. iii. t. 179. Spreng. Sys. ii. p. 39.
A. paniculatum, Bot. Mag. No. 973.

Hab. in Caucasio. Floret Julio et Augusto.

Bulbus ovatus, elongatus, aggregatus: *tunicis* externis fuscis obductus, fibras longas albas emittens. *Caulis* adscendens, teres, atro-viridis, interdum uno latere compressiuscula, pedalis, basi foliosus. *Folia* disticha, angustè semicylindrica, striata asperiuscula. *Vaginæ* teretes, pallidæ, striatæ. *Spatha* bivalvis, elongata, foliacea, reflexa; valvâ alterâ breviore. *Umbella* sphærica, laxa. *Pedicelli* capillares, viridi-albi, semiunciam longi. *Perianthium* roseum, erectum, mediocre: *laciniæ* ovato-lanceolatæ, acutæ, tres exteriores breviores; omnes lineolis dorsalibus saturatioribus vel viridi-rubris notatæ. *Stamina* perianthium duplo superantia. *Filamenta* subulata, teretia, rubra. *Antheræ* oblongæ, fusco-rubræ, effœtæ nigræ: *polline* ochroleuco. *Pistilla* staminibus multo breviora. *Ovarium* rotundum, rubro-fuscum. *Stylus* teres, ruber. *Stigma* obtusiusculum, album. *Capsula* obtuse trigona: *loculis* dispermis.

59. *All. rupestre*, caule basi folioso, foliis teretiusculis striatis, spathâ bivalvi elongatâ, umbellâ fastigiatâ, perianthii laciniis ovatis obtusiusculis conniventibus, staminibus perianthio sæpius paulo longioribus.

Allium rupestre, Fl. Taur. Cauc. Suppl. p. 259. Spreng. Sys. ii. p. 40.

Hab. in Caucaso. Floret Julio et Augusto.

Bulbus ovatus, elongatus, aggregatus; *tunicis* externis fuscis obductus. *Caulis* fere pedalis, basi foliosus. *Folia* teretiuscula, supra subcanaliculata, caulem æquantia. *Spatha* bivalvis, valva altera longissima. *Umbella* fastigiata, conferta. *Pedicelli* æquales, teretes, albidi. *Perianthium* erectum, roseum: *laciniæ* ovato-lanceolatæ, acutiusculæ. *Stamina* perianthio paulo longiora. *Filamenta* subulata, teretia, erubescentia. *Antheræ* oblongæ, fusco-rubræ. *Pistilla* staminibus longiora. *Ovarium* luteo-viride. *Stylus* teres. *Stigma* obtusiusculum. *Capsula* obtuse trigona: *loculis* dispermis.

OBS. This plant differs from the preceding, in having the petals more obtuse, and the stamens scarcely longer than the perianth.

OBS. Facies varietatis macilantis atque paucifloræ Allii paniculati. *Umbella* circiter decemflora. *Pedicelli* flore vix duplo longiores. *Spatha* valva altera valde elongata, ut in Allio paniculato paulo minus obtusa; *petala* carnea seu rosea; carina saturatiore. *Stylus* corollam quidquam superans.—Bib. Flora Taur. Caus. l. c.

60. *All. globosum*, caule folioso, foliis teretibus filiformibus, spathâ bivalvi elongatâ, umbellâ globosâ confertâ, perianthii laciniis acutis, staminibus perianthium superantibus.

Allium globosum, Fl. Taur. Cauc. i. p. 262. Suppl. p. 257. Lam. Encycl. Suppl. p. 269.
A. Tauricum, Pallas. ined. in Herb. Lamb.
A. foliis semicylindricis caulinis, spatha longissima, capitulo globoso, Gmel. Siber. i. p. 51. t. 10.
A. genus forte scorodoprasum alterum, Lob. ex Bauh. Hist. ii. p. 564.

Hab. in Sibiria, Caucaso. Floret Julio et Augusto.

Bulbus elongatus, aggregatus, tunicis externis fuscis vestitus. *Caulis* inferne foliosus a ½ ad sesquipedalem, erectus. *Folia* anguste filiformia, subsemicylindrica, carnosula, acuta. *Spatha* bivalvis, elongata, foliacea, valvâ unâ longitudine umbellæ, alterâ longissima. *Umbella* globosa, conferta. *Pedicelli* breves. *Perianthium* rubrum vel carneum: *laciniæ* ovato-lanceolatæ, acutæ, nervo medio saturatiore. *Stamina* subulata, perianthio fere duplo longiora.

Obs. This plant may easily be known from any of the preceding, by its larger size and closer umbel. The representation in the "Flora Sibirica" is good; except that, in the living plants I have seen, the umbels are much more dense. *Allium Caucasicum* comes very near to this plant; but the umbels are lax, the stems are not leafy from the middle, and it is not half the size.

61. *All. staticiforme*, caule folioso, foliis recurvis semicylindricis fistulosis, spathâ bivalvi brevi apice subulatâ, umbellâ globosâ densâ, perianthii laciniis obovato-oblongis obtusis, staminibus perianthio paulo longioribus.

Allium staticiforme, Fl. Græc. t. 320. Prod. i. p. 225. Spreng. Sys. ii. p. 39.
A. flexuosum, Urvill. in Mem. Soc. Lin. Paris. i. No. 776. Spreng. Sys. ii. p. 38.

Hab. in Græcia. Floret Julio.

Bulbus fere globosus, albidus, bulbillis circumdatus. *Caulis* spithamæus, teres, inferne foliosus, rubicundus, flexuosus. *Folia* semicylindrica, recurva, fistulosa. *Vaginæ* teretes, læves. *Spatha* bicornis, deflexa, apice subulata. *Umbella* globosa, densa. *Perianthium* carneum: *laciniæ* obovatæ, obtusæ; nervo medio saturatiore. *Stamina* subulata, paulo exserta. *Antheræ* luteæ. *Pistilla* staminibus breviora. *Ovarium* turbinatum. *Stylus* brevis. *Stigma* acutum. *Capsula* subrotunda, perianthiis emarcidis persistentibus vestita: *loculis* monospermis.

SECT. 2.—Floribus *roseis stamina æquantibus.*

62. *All. montanum,* caule folioso, foliis semicylindricis acutis, spathâ bivalvi elongatâ deflexâ, umbellâ subrotundâ laxâ, perianthii laciniis obovatis.

Allium montanum, Fl. Gr. t. 319. Prod. i. p. 225. Spreng. Sys. ii, p. 39.

A. montanum, radice oblonga, Bauh. Pin. 75.

Hab. in Græcia. Floret Junio et Augusto.

Bulbus oblongus seu rotundus; tunicis externis fuscis. *Caulis* foliosus, teres, spithamæus. *Folia* plerumque bina, semicylindrica, acuta, supra canaliculata. *Spatha* bivalvis, elongata, foliacea. *Umbella* subrotunda, laxa. *Pedicelli* æquales, rubicundi. *Perianthium* mediocre, roseum: *laciniæ* obovatæ, nervo medio saturatiore. *Stamina* subulata longitudine perianthii. *Antheræ* rotundæ, flavæ. *Ovarium* sexstriatum.

SECT. 3.—Floribus *cinereis stamina æquantibus.*

63. *All. parviflorum,* caule folioso, foliis semiteretibus, spathâ bivalvi elongatâ, umbellâ globosâ confertâ, perianthii laciniis ellipticis apice bipartitis.

Allium parviflorum, Lin. Sp. Pl. 427. Desf. Fl. Atl. i. p. 290. Lap. Fl. de Pyr. p. 180. Lam. Encycl. i. p. 67. Suppl. p. 266. Spreng. Sys. ii. p. 39.

Hab. in montibus Africæ borealis prope Mascar, Desf.; in Rossia, Pall.; in Europa australi, Lin.

Bulbus ovatus, albus. *Caulis* tenuis, erectus, pedalis et ultra, infra medium foliosus. *Folia* subulata, semiteretia, caule breviora, lævia. *Spatha* 2-valvis, elongata, foliacea (univalvis decidua in plantâ Ruthenicâ). *Umbella* confertiflora, globosa. *Pedicelli* breves. *Perianthium* parvum, cinereum: *laciniæ* ellipticæ, apice bipartitæ, exteriores breviores cum lineolis dorsalibus viridibus. *Stamina* perianthium subæquantia. *Filamenta* subulata, basi dilatata.

Obs. This plant is in habit like *All. sphærocephalum*, but the stamens are all simple, and equal with the perianth, and the spaths two-horned. The flowers are very small.

Sect. 4.—Floribus *albidis stamina includentibus.*

64. *All. circinatum*, caule basi folioso, foliis filiformibus spiraliter tortis vaginisque pilosissimis, spathâ diphyllâ lanceolatâ apice mucronatâ, umbellâ subtriflorâ, perianthii laciniis lanceolatis acutis.

Allium circinatum, Sieb. Trav. i. p. 239. t. 6. Spreng. Sys. ii. p. 39.
A. Cupanii, Raff. ex Spreng. Sys. ii. p. 40.

Hab. in Sicilia.

Bulbus oblongus, tunicis externis reticulato-fibrilosis fuscis obductus. *Caulis* basi foliosus, teres, 3- v. 4-uncialis, pilosus. *Folia* filiformia, spiraliter torta, vaginisque pilosissima; pilis longis. *Spatha* diphylla, lanceolata, apice mucronata, umbella breviora. *Umbella* subtriflora. *Perianthium* forsan album: *laciniæ* lanceolatæ, acutæ. *Stamina* subulata, perianthio fere dimidio breviora.

Obs. It appears to me that *All. Cupanii* is the same as *All. circinatum*. They agree in every particular, except there is no mention made of hairiness in *All. Cupanii*. I have not seen the plant.

65. *All. moschatum*, caule basi folioso, foliis setaceo-subulatis scabriusculis, spathâ bivalvi interdum univalvi brevi mucronatâ, umbellâ pauciflorâ laxâ, perianthii laciniis ovato-lanceolatis acutis.

Allium moschatum, Lin. Sp. Pl. 427. Lam. Encycl. i. p. 67. Suppl. p. 267. Mill. Dict. ed. Mart. No. 19. Willd. Sp. Pl. ii. p. 72. Pers. Syn. i. p. 356. Lam. et Dec. Fl. Fr. iii. pt. i. No. 1969. Spreng. Sys. ii. p. 39.
A. setaceum, Walds. et Kit. Pl. rar. Hung. i. p. 70. t. 68. Pers. Syn. i. p. 359. Lam. Encycl. Suppl. p. 271.
A. capillare, Willd. Sp. Pl. ii. p. 82. Pers. Syn. i. p. 358. Lam. Encycl. Suppl. p. 272.
A. tenuifolium, Habl. Taur. p. 162.
A. foliis teretibus caulinis, floribus umbellatis, Hall. All. No. 17. Opusc. p. 367. Monogr. No. 14.
A. foliis radicalibus capillaribus scapo brevioribus, Cav. icon. p. 4. t. 206. f. 1.
A. sylvestre s. Moly moschatum capillaceo folio, Mag. Bot. Monogr. p. 11.
Moly moschatinum vel Zebettinum, Monspeliense, Park. Parad. p. 143.
Moly moschatum capillaceo folio, Bauh. Prod. p. 28. cum icon. Pin. 76. Raii, Hist. ii. p. 1119. No. 9. Mill. Dict. No. 7.
A. sylvestre perpusillum juncifolium moschatum, Lob. Adv. p. 501. Bauh. Hist. ii. p. 565. Morr. Hist. ii. sect. iv. p. 386. t. 14. f. 6.
A. sylvestre perpusillum juncifolium, floribus albis, Chab. Stirp. p. 203.

Hab. in Italia, Hispania, Tauria, Sibiria, et Hungaria. Floret Junio et Julio.

Bulbus ovatus, oblongus, simplex tunicis externis nigro-fuscis reticulato-fibrillosis obductus. *Caulis* 5- v. 6-pollicaris, tenuis, filiformis, foliosus. *Folia* setacea, subulata, scapum æquantia, supra canaliculata aut planiuscula, subtus sulcata; costis scabriusculis, marginibus ciliatis. *Spatha* bivalvis, brevis, mucronata. *Umbella* 6–10-flora, in planta culta 20 ad 30 flora, erecta, ante anthesin obliqua. *Pedicelli* semiunciam longi, teretes, filiformes. *Perianthium* albidum: *laciniæ* ovato-lanceolatæ, acutæ, interdum apice marginatæ, nervo medio purpurascente, post deflorationem fuscescens. *Stamina* perianthio breviora. *Filamenta* subulata, dilatata, basi cohærentia, alba. *Antheræ* fuscescentes, sub anthesin glaucæ. *Pistilla* staminibus breviora. *Ovarium* ovatum, album, versus apicem purpurascens. *Stylus* teres, albescens. *Stigma* acutiusculum.

66. *All. tenuissimum*, caule basi folioso, foliis subulato-filiformibus fistulosis, spathâ bivalvi sæpius univalvi brevi mucronatâ, umbellâ laxâ paucíflorâ, perianthii laciniis ovato-oblongis obtusis.

Allium tenuissimum, Lin. Sys. 324. Willd. Sp. Pl. ii. p. 83. Pers. Syn. i. p. 358. Spreng. Sys. ii. p. 40. Lam. Dict. i. p. 70. Suppl. p. 272.
Cepa scapo nudo tereti inani, foliis subulatis filiformibus, capitulis laxis paucifloris, Gmel. Sib. i. p. 61. t. 15. p. 2 et 3.

Hab. in Sibiria.

Bulbus tenuis, dilute purpureus, fibras albas longas emittens. *Caulis* palmaris, teres, tenuissimus. *Folia* subulata, filiformia, acuta, fistulosa, teretia, longitudine caulis. *Spatha* univalvis, interdum bivalvis, brevis, mucronata. *Umbella* laxa, 6 vel 18 flora. *Pedicelli* semiunciam longi, teretes, pallide rubentes. *Perianthium* pallide purpurascens, vel albidum, exterius nutans: *laciniæ* ovato-oblongæ, obtusæ; nervo medio saturatiore. *Stamina* perianthio paulo breviora. *Filamenta* subulata, basi cohærentia. *Antheræ* pallide luteæ. *Stylus* fere longitudine staminum.

SECT. 5.—Floribus *albidis*; staminibus *longè exsertis*.

67. *All. Stellerianum*, scapo subnudo, foliis semicylindricis acutis, spathâ bi- vel tri-valvi brevi, umbellâ laxâ multiflorâ, perianthii laciniis oblongis obtusis.

Allium Stellerianum, Willd. Sp. Pl. ii. p. 82. Pers. Syn. i. p. 358. Spreng. Syst. ii. p. 40. Lam. Encycl. Suppl. p. 272.
A. radicibus tunicatis, foliis semicylindricis, floribus umbellatis, Hall. All. No. 16. Opusc. p. 366.
Cepa scapo nudo tereti inani, foliis semicylindraceis, capitulis spissis multifloris, Gmel. Sib. i. p. 63. t. 16. f. 1 et 2.

Hab. in Sibiria.

Bulbus elongatus, aggregatus tunicis externis purpureis obductus, fibras purpureas emittens. *Caulis* subnudus, teres, ½ ad pedalem, lævis, crassitudine pennæ corvinæ. *Folia* semicylindrica, setacea, acuta, viridia, scapo breviora. *Spatha* 2- vel interdum 3-valvis, brevis, mucronata. *Umbella* subfastigiata, laxa, multiflora. *Pedicelli* teretes, plerumque semiunciam longi. *Perianthium* mediocre, viridi-albescens: *laciniæ* oblongæ, obtusæ, exteriores paulo minores. *Stamina* subulata, longe exserta, basi connexa. *Antheræ* oblongæ, luteæ. *Stylus* subulatus, longitudine staminum.

68. *All. saxatile*, caule basi folioso, foliis semiteretibus, spathâ bivalvi elongatâ, umbellâ subfastigiatâ medio convexâ, perianthii laciniis ovato-oblongis.

Hab. in Caucaso. Floret Julio et Augusto.

Allium saxatile, Marsh. Bieb. Casp. p. 167. App. No. 39. Cent. Plant. rar. Rossica, i. t. 29. Hoffm. Hort. Mosc. ann. 1808. No. 97. Lam. Encycl. Suppl. p. 273. Bieb. in Annals Bot. ii. p. 437. Fl. Taur. Cauc. i. p. 264. Suppl. p. 260. Spreng. Sys. ii. p. 39.

Bulbi oblongi, aggregati, tunicis externis fuscis vestiti. *Caulis* fere nudus, teres. *Folia* semicylindrica, striata, scabriuscula *Spatha* 2-valvis, elongata, foliacea. *Umbella* subfastigiata, medio convexa. *Perianthium* album: *laciniæ* ovato-oblongæ. *Stamina* subulata, perianthio multo longiora.

OBS. Although *All. moschatum, Stellerianum, tenuissimum,* and *circinatum,* are said to have short spaths, yet nevertheless they agree in every other essential point with this division, and cannot with propriety be separated. However, it may be seen that they have leafy points at the extremities of their spaths, which at once shews that they belong to this division.

◆

RHIZIRIDEUM.

DIVISIO VII.—*Umbella* capsulifera, ante anthesin nutans. *Spatha* 2 vel 3-loba, brevis, marcescens. *Stamina* subulata. *Scapi* centrales vel laterales nudi. *Folia* disticha narcissina. *Bulbi* basi rhizomatosa repente.

SECT. 1.—Stamina *alterna latiora;* scapis *teretibus.*

69. *All. strictum,* scapo subnudo, foliis anguste linearibus longis obtusis supra canaliculatis, spathâ bivalvi, umbellâ fastigiatâ confertiflora, perianthii laciniis externis cucullatis obtusiusculis intimis lanceolatis obtusis, staminibus alternis plerumque basi trifidis, perianthio æqualibus.

Allium strictum, Schrad. Hort. Gœt. i. t. 1. Link. Enum. i. p. 316. Trev. All. No. 10. Spreng. Sys. ii. p. 316.
A. Volhynicum, Bess. Cat. Hort. Crim. Suppl. iii. p. 2.
A. deflexum, Willd. Sp. Pl. ii. p. 65. Lam. Encycl. Suppl. p. 264. Pers. Syn. i. p. 355.
A. strictum, var. β, Trev. All. No. 10.

Hab. in Volhynia, Sibiria. Floret Junio.

Bulbus elongatus tunicis externis reticulatis fuscis obductus, radice transversali adnatus. *Caulis* pedalis, teres, plerumque basi folio unico instructus, crassitudine pennæ corvinæ. *Folia* longa anguste linearia, obtusa, viridia, subtus convexa, supra canaliculata. *Spatha* bivalvis, mucronata, fere longitudine pedunculorum. *Umbella* subfastigiata, medio convexa, multiflora. *Pedicelli* ½-unciam longi, teretes, bracteolis intermixti. *Perianthium* pallide roseum: *laciniæ* interiores lanceolatæ, obtusæ; exteriores breviores lanceolatæ, obtusiusculæ, cum lineâ dorsali saturatiore. *Stamina* perianthio æqualia. *Filamenta* subulata, basi dilatata, alterna basi latiora bifida vel trifida; dentibus brevibus, obtusis, sed sæpius obliteratis. *Capsula* obtuse trigona: *loculis* dispermis.

70. *All. lineare*, caule folioso, foliis anguste linearibus obtusis, spathâ 2-valvi, umbellâ subglobosâ, perianthii laciniis oblongis obtusis, staminibus alternis basi trifidis, appendicibus lateralibus brevibus acuminatis, perianthium subæquantibus; intermediis antheriferis duplo longioribus.

Allium lineare, Lin. Sp. Pl. 423. Reich. ii. p. 29. Mill. Dict. ed. Mart. No. 3. Lam. Dict. i. p. 64. Suppl. p. 263. Willd. Sp. Pl. ii. p. 64. Pers. Syn. i. p. 355. Fl. Taur. Cauc. i. p. 262. Willd. Enum. i. p. 357. Hort. Kew. ii. p. 232. Fl. Taur. Cauc. Suppl. p. 251. Trev. All. No. 11. Spreng. Sys. ii. p. 34.
A. staminibus alterne trifidis, radice tunicis reticulatis obducta, Hall. All. No. 9. Opusc. p. 352.
Porrum caule tereti folioso, foliis linearibus planis, umbella globosa, staminibus corolla longioribus, Gmel. Sib. i. p. 56. t. 13 et 14. f. 1.

Hab. in Sibiria. Floret Julio et Augusto.

Bulbus elongatus, cæspitosus tunicis externis reticulatis fuscis obductus, basi rhizomatosus repens, ut in Allio senescente. *Caulis* pedalis et interdum ultra, crassitudine pennæ corvinæ, fere infra medium foliosus. *Folia* anguste linearia, subtus convexa, apice obtusa. *Spatha* 2-valvis, acuta, fere longitudine pedunculorum. *Umbella* subglobosa. *Pedicelli* filiformes, ¼ unciam longi. *Perianthium* parvum, rubrum: *laciniæ* oblongæ, obtusæ (lineolis dorsalibus saturatioribus), externæ angustiores, breviores, et plus cucullatæ. *Stamina* perianthio duplo longiora. *Filamenta* plana, basi dilatata, alterna latiora, trifida: *appendicibus* lateralibus brevibus, acuminatis, dentiformibus, perianthio æqualibus; intermediis antheriferis duplo longioribus. *Pistilla* staminibus breviora. *Stylus* teres. *Stigma* obtusiusculum. *Capsula* trigona: *loculis* 2-spermis.

Obs. This plant is in habit like *All. strictum*, but sufficiently distinguished from it, by its leafy stems, and the lateral appendages of the stamens being acuminate (not obtuse, and shorter than the perianth, never wanting, as in *All. strictum*), and equal to the perianth. The stamens are also double the length of the perianth, while those of *All. strictum* are equal with the perianth.

Sect. 2.—Stamina *alterna latiora*; scapis *ancipitibus*.

71. *All. nutans*, scapo nudo, foliis lato-linearibus, subtus lævibus glaucescentibus scapo multo brevioribus, spathâ bivalvi, umbellâ fastigiatâ multiflorâ, perianthio laciniis ovato-lanceolatis cucullatis, staminibus basi plerumque alterne trifidis perianthio longioribus.

Allium nutans, Lin. Sp. Pl. 429. Reich. ii. 37. Bot. Mag. No. 1143. Lam. Encycl. i. p. 68. Suppl. p. 267. Mill. Dict. ed. Mart. No. 26. Willd. Sp. Pl. ii. p. 74. Pers. Syn. i. p. 357. Red. Lilia, iv. t. 233. Hort. Kew. ii. p. 236. Willd. Enum. i. p. 359. Trev. All. No. 9. Spreng. Sys. ii. p. 34.

A. staminibus alterne trifidis, foliis latissimis, capite sphærico, radice laterali solitaria, Hall. All. No. 6. Opusc. p. 347.

A. scapo nudo ancipiti, foliis linearibus planis, staminibus tricuspidatis, Hort. Ups. p. 80.

Porrum scapo nudo ancipiti, antequam floruerit nutante, foliis ensiformibus, hinc paulo convexioribus, Gmel. Sib. i. p. 55. t. 12.

Hab. in Sibiria. Floret Junio et Julio.

72. *All. senescens*, scapo nudo, foliis linearibus subtus lævibus, spathâ bivalvi, umbellâ fastigiatâ multiflorâ, peri-

anthii laciniis oblongis obtusis, staminibus alternis basi interdum alatis, perianthio longioribus.

Allium senescens, Lin. Sp. Pl. 430. Knip. Cent. 8. No. 5. Reich. ii. 38. Allion. Pedm. No. 1879. Vill. Dauph. ii. p. 252. Lam. Encycl. i. p. 68. Suppl. p. 267. Hoffm. Germ. 117. Roth. Germ. ii. p. 385. Mill. Dict. ed. Mart. No. 28. Lap. Fl. de Pyr. abr. p. 181. Willd. Sp. Pl. ii. p. 75. Pers. Syn. i. p. 357. Bess. Fl. Gal. i. p. 233. Willd. Enum. i. p. 360. Hort. Kew. ii. p. 237. Trev. All. No. 14.
A. purpureum, Salis. Hort. chap. aller. p. 235.
A. angulosum, var. β, pratense, Lam. et Dec. Fl. Fr. iii. pt. i. p. 222. No. 1958.
A. scapo nudo ancipiti, foliis linearibus, subtus convexis, umbella subglobosa, staminibus subulatis, Hort. Ups. p. 79.
A. radice senescente lignosa transversa, foliis radicalibus, gramineis, floribus umbellatis, Hall. Helv. ii. p. 109. No. 1227. Var. γ pratense amplius flore majori.
A. radice senescente lignosa transversa, Hall. All. No. 19. Opusc. p. 370. Monogr. No. 16.
A. caule ancipiti teretiusculo, foliis ensiformibus, hinc paulo convexioribus, Gmel. Sib. i. p. 53. t. 11. f. 2.
A. narcissifolium, Scop. Carn. ii. p. 238. No. 400.
A. montanum, foliis narcissi majus, Bauh. Pin. 75. Rudb. Elys. i p. 157.
A. umbelliferum pratense, Bauh. Hist. ii. p. 564.
A. montanum, foliis narcissi, Rupp. Fl. Jen. ed. ii. p. 122; ed. iii. p. 152.
A. saxatile aconi radice, flore purpureo, Barl. icon. t. 1020. Buccon. Mus. de Fiante ii. p. 84. t. 79. Tour, Inst. p. 384.
Moly narcissinis foliis, Park. Theat. p. 142.
A. sylvestre petræum umbelliferum, floribus numerosis purpureis, Chab. Stirp. p. 203.
Porrum sylvestre, Tab. Icon. p. 485.
A. s. moly narcissinis foliis, ii. Cluss. Pann. 221. Hist. p. 195. Raii Hist. ii. p. 1121. Ger. Emac. p. 186. Park. Par. p. 142.

Hab. in Sibiria, Germania, Sicilia, Silesia, Helvetia. Floret Julio et Augusto.

Bulbi radici lignosæ transversali adnati. *Scapus* 1 ad 2-pedalem, anceps viridis, foliis paulo longior. *Folia* disticha, linearia, obtusa, glaucescentia, plus minusve torta, subtus convexa, lævia. *Spatha* bivalvis, brevis, ovata, acuminata, pedunculis brevior. *Umbella* multiflora, fastigiata, medio convexa. *Pedicelli* semiunciam longi, et ultra apicem incrassati. *Perianthium* dilute purpurascens: *laciniæ* ovato-lanceolatæ, obtusæ, interdum emarginatæ, paulo fornicatæ, exteriores minores; lineolis dorsalibus saturatioribus carinatæ. *Stamina* perianthio paulo longiora. *Filamenta* subulata, alterna basi latiora purpurascentia, sæpe alata, hinc interdum bifida v. trifida: dentibus brevissimis, obtusis. *Antheræ* oblongæ, fuscæ, effœtæ, nigræ: *polline* ochroleuco. *Pistilla* stamina æquantia. *Ovarium* rubescens. *Stylus* teres, dilute purpurascens. *Stigma* obtusiusculum. *Capsula* obtuse trigona: *loculis* dispermis.

73. *All. Andersonii*, scapo nudo, foliis angustissimis linearibus subtus lævibus viridiusculis, spathâ bivalvi, umbellâ fastigiatâ multiflorâ, perianthii laciniis ovato-oblongis obtusis fornicatis, staminibus alternis basi alatis tunc bifidis vel trifidis perianthium paulo superantibus.

Hab. in Sibiria. Floret Julio et Augusto.

Obs. This plant was received by Mr Anderson of the Chelsea Botanic Garden under the name of *Allium senescens*; it may be easily distinguished from that species by its very narrow green leaves.

74. *All. spurium*, scapo nudo striato, foliis angustissimis, linearibus subtus lævibus viridiusculis, spathâ bivalvi, umbellâ fastigiatâ multiflorâ, perianthii laciniis ovato-lanceolatis acutiusculis fornicatis, staminibus perianthio longioribus.

Hab. in Sibiria. Floret Julio et Augusto.

Obs. This plant I have seen no where but at the Nursery of Messrs Loddiges of Hackney.

75. *All. glaucum*, scapo nudo, foliis linearibus glaucis magis tortis subtus lævibus, spathâ bivalvi brevissimâ, umbellâ fastigiatâ multiflorâ, perianthii laciniis lanceolatis obtusis concavis, staminibus perianthio paulo longioribus.

Allium glaucum, Schrad. Cat. sem. e Hort. Gœtt. anno 1814. Poir. Encycl. Suppl. p. 265.
A. Baicalense, Willd. Enum. i. p. 360.
A. spirale, ejusdem Suppl. p. 17.

A. senescens, Bot. Mag. No. 1150.
A. montanum, Schmidt. Bohem. No. 422.
A. Illyricum, Link. vel Otto in Litteris ex Hort. Berlin. non Jacq.

Hab. in Sibiria. Floret Julio et Augusto.

Obs. In choosing amongst the many names which has been given to this plant, I have adopted the most expressive, it being the most glaucous species I am acquainted with.

76. *All. uliginosum*, scapo nudo, foliis linearibus canaliculatis carnosulis subtus angulatis, scapo subæquali, spathâ bivalvi brevi, umbellâ fastigiatâ paucflorâ.

Allium angulosum, Lour. Cochin. p. 203.
A. senescens, Thunb. Jap. p. 132.

Hab. in China, et Cochinchina (Loureiro), in Insula Nipon, Thunberg. Floret in Junio, et sequentibus mensibus.

Bulbus albus, linearis, radici nigrescenti transversali adnatus. *Scapus* nudus, anceps, 6-pollices altus, foliis subæqualis. *Flores* albi v. rubri.

Obs. Although the characters of *Allium nutans*, *senescens*, and *Andersonii*, as far as I have been able to discover, are slight, nevertheless they are widely different in habit. *Allium nutans* is nearly triple the size of *Allium senescens*, and *Allium Andersonii* is a very narrow-leaved plant. The alternate stamens of the above three are winged at the base, and are furnished, for the most part, with one, sometimes two, short blunt teeth. *Allium glaucum* and *spurium* have their alternate stamens broader, but never winged or toothed: the first may easily be recognized by its very glaucous appearance, and the leaves being more spiral; the second by its green leaves, and somewhat acute laciniæ of the perianth.

SECT. 3.—Stamina *alterna latiora*; scapis *angulatis*.

77. *All. angulosum*, glaucescens, scapo nudo, foliis angustissimis linearibus subtus obscure sulcatis, spathâ bi- vel tri-valvi, umbellâ multiflorâ fastigiatâ, perianthii laciniis oblongo-lanceolatis acutiusculis, staminibus perianthium paulo superantibus.

Allium angulosum, Lin. Sp. Pl. 430. Reich. ii. p. 38. Poll. Pall. 329. Jacq. Aust. v. p. 11. t. 423. Allion. Pedm. No. 188. Gært. Fruct. i. p. 56. t. 16. f. g. Lam. Encycl. i. p. 68, Suppl. p. 267. Hoffm. Germ. 117. Roth. Germ. i. p. 147; ii. p. 384. Mill. Dict. edit. Mart. No. 13. Lap. Fl. de Pyr. abr. p. 181. Willd. Sp. Pl. ii. p. 76. Bot. Mag. No. 1149. Pers. Syn. i. p. 357. Bess. Fl. Gall. i. p. 233. Lam. et Decan. Fl. Fr. iii. pt. i. No. 1958. Willd. Enum. i. p. 361. Hort. Kew. ii. p. 237. Red. Liliac. v. t. 281. Trev. All. No. 13. Spreng. Sys. ii. p. 37.
A. narcissifolium, var. α, Vill. Delph. ii. p. 258. Var. β, Scop. Carn. No. 400.
A. radice senescente lignosa transversa, foliis radicalibus gramineis, floribus umbellatis, var. α minor et β, Hall. Helv. No. 1227. p. 109.
A. radice senescente lignosa transversa, Hall. All. No. 19. Opusc. p. 370. Var. α et β, Monogr. No. 16.
Cepa scapo nudo subangulato farcto, foliis linearibus subtus angulatis, staminibus corolla brevioribus, Gmel. Sib. i. p. 58. t. 14. f. 2.
A. montanum, foliis Narcissi minoris, Bauh. Pin. 75. Morr. ii. sect. iv. p. 388. t. 15. f. 14. tertium. Ger. Emac. p. 186. Minimum Rudb. Elys. p. 188. Rand. Hort. Chels. p. 9.
A. montanum minus, Bauh. Pin. 72.
A. petræum, umbelliferum, Bauh. Hist. ii. p. 564. Raii Hist. p. 1120. No. 7.
A. saxatile, Cam. Hort. p. 10.
Moly foliis narcissi, Lob. Icon. t. 161. Obs. p. 82.
Allium sive Moly narcissinis foliis, secundum, Clus. Pann. t. 222. Hist. p. 196.
A. sylvestre secundum, Tab. Icon. t. 485.
A. montanum, radice oblonga, Gesn. Tab. Coll. p. 57.

Hab. in Austria, Gallia, Sibiria, Germania. Floret Augusto et Septembri.

Bulbi radici lignescenti transversali adnati. *Scapus* 9-uncias vel pedem altus, gracilis, angulatus, viridiusculus. *Folia* disticha, angustissima, linearia, glaucescentia, obtusa, supra canaliculata subtus convexa, sulcata, plus minusve torta, scapis breviora. *Spatha* bi- interdum trivalvis, longitudine pedunculorum. *Umbella* fastigiata, multiflora, medio convexa. *Pedicelli* angulati, semiunciam longi, apice incrassati. *Peri-*

anthium dilute purpureum: *laciniæ* oblongæ, lanceolatæ, acutiusculæ, exteriores breviores, lineolis dorsalibus saturatioribus carinatæ. *Stamina* perianthio æqualia, interdum longiora. *Filamenta* subulata, basi dilatata, alterna latiora. *Antheræ* purpurascentes vel nigrescentes, interdum luteæ: *polline* ochroleuco. *Pistilla* staminibus æqualia. *Ovarium* albescens, obtusè trigonum. *Stylus* teres, interdum curvatus, purpurascens. *Stigma* album, obtusiusculum. *Capsula* obtuse trigona: *loculis* dispermis.

Obs. This is the smallest species of this tribe, and seldom flowers before the month of September.

Var. β Lusitanicum, foliis angustioribus.

Allium Lusitanicum, Red. Liliac. v. t. 271. Brot. Fl. Lusit. i. p. 548. Poir. Encycl. Suppl. p. 272.

78. *All. acutangulum*, scapo nudo, foliis linearibus, subtus angulatis acute carinatis, spathâ bi- s. tri-valvi, umbellâ fastigiatâ multiflorâ, perianthii laciniis ovato-lanceolatis acutis fornicatis, perianthio æqualibus.

Allium acutangulum, Willd. Enum. Suppl. p. 16. Horn. Hofn. p. 40. Link. Enum. p. 319.
Moly montanum secundum, Ger. Emac. p. 186.

Hab. in Germania. Floret Augusto et Septembri.

Planta 2 ad 3 pedes alta, viridis. *Umbella* laxa, fastigiata. *Pedicelli* unciam longi.

Var. β, perianthii laciniis obtusioribus et foliis subtus non angulosis.

79. *All. Danubiale*, scapo nudo ancipiti, foliis linearibus subtus convexis lævibus, spathâ bi- vel tri-valvi, pedicellis breviore, umbellâ multiflorâ fastigiatâ, perianthii laciniis ovato-oblongis obtusiusculis cucullatis, perianthium æquantibus.

Allium Danubiale, Spreng. Mant. i. p. 38. Schweigg. Cat. Hort. Regiomont. p. 9.
A. inodorum, Willd. Sp. Pl. ii. p. 76.

Var. β foliis angustioribus.

Hab. ad ripas Danubii fluminis. Floret Junio et Septembri.

Planta bipedalis. *Umbella* conferta. *Pedicelli* semiunciam longi.

80. *All. laxum*, scapo nudo, foliis linearibus subtus angulatis, spathâ bi- v. tri-valvi, pedicellis breviore, umbellâ laxâ, perianthii laciniis ovato-lanceolatis acutis interdum emarginatis, staminibus alternis latioribus perianthio paulo brevioribus.

Hab. in Sibiria. Floret Junio et Augusto.

Planta læte virens, sesqui- ad bipedalis altus. *Umbella* laxa. *Pedicelli* a semi ad unciam longi.

81. *All. serotinum*, scapo nudo gracili, foliis anguste linearibus glaucescentibus subtus lævibus, spathâ bi- v. trivalvi, pedicellis breviore, umbellâ confertâ globosâ, perianthii laciniis oblongis obtusis, staminibus perianthio duplo longioribus.

Allium serotinum, Schleich. Cat. 1821.
A. confertum, Fish. Cat. 1821.

Hab. in Helvetia et Sibiria. Floret Augusto et Septembri.

Planta glaucescens, pedalis ad sesquipedalis. *Umbella* conferta, globosa. *Pedicelli* semiunciam longi. *Antheræ* luteæ.

Obs. *Allium angulosum*, *acutangulum*, and *Danubiale*, have been regarded by some authors as varieties of the same; but to this opinion, on examination, I cannot agree, as their habits, and also their characters, are widely distinct, considering that they belong to so natural and numerous a genus.

Sect. 4.—Flores *albidi*; stamina *alterna latiora*; scapis *angulatis*

82. *All. albidum*, scapo nudo foliis anguste linearibus subtus sulcatis altiore, spathâ bivalvi brevi mucronatâ pedicellis breviore, umbellâ fastigiatâ multiflorâ, perianthii laciniis oblongo-lanceolatis obtusis cucullatis, staminibus

alternis basi alatis, hinc plerumque bifidis vel trifidis, perianthium æquantibus.

Allium albidum, Fl. Taur. Caucas. Suppl. p. 260. Spreng. Sys. ii. p. 34.
A. angulosum, Fl. Taur. Cauc. i. p. 464. No. 657.

Hab. in Tauria. Floret Junio et Julio.

Bulbus ovatus, radici transversali lignescenti adnatus. *Scapus* nudus, semipedalis, multangulus, glaucescens, crassitudine pennæ corvinæ. *Folia* disticha, semicylindrica, obtusa, supra canaliculata, subtus convexa, sulcata, scapo breviora. *Spatha* bivalvis, brevis, ovata, acuminata, pedunculis brevior. *Umbella* fastigiata, multiflora, ante expansionem nutans. *Pedicelli* angulati, glaucescentes, semiunciam longi. *Perianthium* album: *laciniæ* oblongo-lanceolatæ, obtusæ, concaviusculæ, exteriores breviores; lineolis dorsalibus fuscis carinatæ. *Stamina* perianthio sæpius æqualia, interdum paulo longiora. *Filamenta* subulata, alba, alterna latiora, simplicia, sed sæpius bi- aut rarius trifida; *appendicibus* brevibus, obtusiusculis. *Antheræ* oblongæ, luteæ. *Pistilla* stamina æquantia. *Ovarium* album, obtuse trigonum. *Stylus* teres, albus. *Stigma* obtusiusculus. *Capsula* obtuse trigona: *loculis* monospermis.

83. *All. flavescens*, scapo nudo obscure ancipiti foliis anguste linearibus subtus lævibus altiore, spathâ bivalvi brevi acuminatâ, pedicellis breviore, umbellâ multiflorâ fastigiatâ, perianthii laciniis ovato-lanceolatis concavis obtusiusculis, perianthium paulo superantibus.

Allium flavescens, Bess. ex Spreng. Sys. ii. p. 39.
A. denudatum, Red. Liliac. vi. t. 357. Hall. de Allio, No. 19. Opusc. p. 372. vas. γ flore albo.
A. pratense folio gramineo, flore albo, oblonga radice, Rudb. p. 159.

Hab. in Tauria, Sibiria. Floret Augusto.

Bulbus fuscescens, radici transversali lignosæ adnatus. *Scapus* fere pedalis, anceps, sed sæpe uno angulo prominente, obscure striatus, foliis altior. *Folia* disticha, anguste linearia, obtusa, basi subtus convexa, lævia. *Spatha* bivalvis, ovato-mucronata, longitudine medii pedunculorum. *Umbella* multiflora, fastigiata, ante expansionem nutans. *Pedicelli* subteretes, semiunciam longi. *Perianthium* albidum:

laciniæ ovato-lanceolatæ, concaviusculæ, obtusiusculæ, plerumque apice emarginatæ, exteriores breviores, nervo rubicundo carinatæ. *Stamina* perianthio paulo longiora, sæpe æqualia. *Filamenta* subulata, pallide purpurascentia, alterna latiora. *Antheræ* oblongæ, luteæ. *Pistilla* stamina æquantia. *Stylus* teres, pallidus. *Stigma* obtusiusculum. *Capsula* obtuse trigona: *loculis* dispermis, sæpe uno loculo abortivo.

OBS. The seed from which this plant was raised, was received by Mr ANDERSON, under the name of *Allium saxatile* of BIEBERSTEIN; but that plant does not belong to this section.

SECT. 5.—Scapis *foliisque semiteretibus.*

84. *All. rubens*, scapo nudo teretiusculo, foliis angustissimis, spathâ bivalvi, umbellâ laxâ subfastigiatâ, perianthii laciniis oblongis obtusis crenulatis, staminibus subulatis alternis latioribus perianthio subæqualibus.

Allium rubens, Schrad. in Willd. Enum. i. p. 360. Link. Enum. p. 320. Trev. All. No. 15.
A. bisulcum, Red. Liliac. v. t. 286. Bot. Mag. No. 1381. Spreng. Sys. ii. p. 38.

Hab. in Germania et Europa australi. Floret Maio et Junio.

Bulbus fuscus, radici transversali lignosæ adnatus, fibras longas violaceas emittens. *Scapus* teres vel uno latere compresso, semipedalis, crassitudine pennæ corvinæ, lævis, viridis. *Folia* disticha, semiteretia, sæpe subtus 2-angulata, hinc subquadrangularia, acuta, lævia, viridia, scapo fere æqualia. *Spatha* bivalvis, brevis, vix longitudine pedunculorum. *Umbella* laxa, expansa, multiflora ante anthesin nutans. *Perianthium* violaceum exterius pendulum: *laciniæ* oblongæ, obtusæ, concaviusculæ, interiores secus marginem crenulatæ, exteriores breviores, apice crenulatæ, nervo rubro-viridi carinatæ. *Stamina* perianthio æqualia, vel paulo breviora. *Filamenta* subulata, infra medium rubra, alterna latiora, omnia basi connexa. *Antheræ* oblongæ, pallide rubræ: *polline* ochroleuco. *Pistilla* stamina æquantia. *Ovarium* trigonum, viride. *Stylus* teres, albus. *Stigma* obtusiusculum. *Capsula* obtuse trigona: *loculis* dispermis, sæpe uno loculo abortivo.

85. *All. prostratum*, scapo nudo declinato, foliis filiformibus, spathâ univalvi, umbellâ fastigiatâ, perianthii laciniis oblongis obtusis crenulatis, staminibus alternis latioribus perianthio fere duplo longioribus.

Allium prostratum, Trev. All. No. 27. Spreng. Sys. ii. p. 39.
A. deflexum, Fisch. Cat. Hort. Gorenk. (nec Willd.)

Hab. in Sibiria. Floret Junio.

Bulbi ovati violacei, radici transversali lignescenti adnati, fibras longas numerosas violaceas emittentes. *Scapus* 4 v. 5 uncias altus, teres, striatus, interdum uno latere compressiusculo viridis. *Folia* disticha, filiformia, semicylindrica, subtus tamen biangulata, et hinc fere tetraquetra, supra basin versus canaliculata, scapo breviora. *Spatha* univalvis, brevis longitudine medii pedunculorum. *Umbella* fastigiata, multiflora, ante expansionem nutans. *Pedicelli* $\frac{1}{4}$-unciam longi, teretes. *Perianthium* dilute purpurascens semiapertum: *laciniæ* oblongæ, obtusæ, interiores secus marginem crenatæ, exteriores breviores concavæ, nervo dorsali rubro carinatæ, apice crenulatæ. *Stamina* perianthio duplo longiora. *Filamenta* violacea, subulata, basi dilatata, alterna latiora. *Antheræ* oblongæ, luteæ. *Pistilla* staminibus subæqualia. *Stylus* teres, violaceus. *Stigma* obtusiusculum. *Capsula* obtuse trigona; *loculis* dispermis. *Semina* rugosa, opaca.

86. *All. congestum*, scapo nudo subtereti, foliis filiformibus, spathâ tri- vel quadrivalvi mucronata, umbellâ confertâ fastigiatâ, perianthii laciniis lanceolatis obtusis, staminibus subulatis, basi dilatatis, alternis latioribus basi alatis perianthio subæqualibus.

Hab. in Sibiria. Floret Junio et Julio.

Flores purpurei. *Scapus* 4 v. 5-uncialis, foliis filiformibus, semicylindricis, subæqualis.

SECT. 7.—Stamina *uniformia, inclusa.*

87. *All. Pedemontanum*, scapis ancipitibus angulatis subnudis, foliis linearibus subtus carinatis obtusis, spathâ bivalvi brevi, umbellâ pauciflorâ, perianthii laciniis oblongis obtusis, cum acumine reflexo, staminibus uniformibus perianthio dimidio brevioribus.

Allium Pedemontanum, Willd. Sp. Pl. ii. p. 77. Pers. Syn. i. p. 357. Lam. et Dec. Fl. Fr. iii. pt. i. No. 1961. Lam. Encycl. Suppl. p. 269.
A. narcissiflorum, var. α majus, floribus minoribus, Trev. All. 16.
A. nigrum, Allion. Pedem. No. 1881. t. 25. f. 1.
A. narcissifolium, Lam. Encycl. i. p. 68.

Hab. in Gallia australi, et in Alpibus Pedemontanis. Floret Julio et Augusto.

Radix ut in Allio senescenti. *Scapus* pedalis anceps, angulatus, basi folio vaginatus, interdum nudus. *Folia* linearia, subtus carinata, apice obtusa, viridia. *Spatha* bivalvis, ovata, acuta, pedicellis brevior. *Umbella* laxa, pauciflora æstivatione cernua. *Perianthium* magnum, roseum, campaniforme: *laciniis* lanceolatis, obtusis, mucrone reflexo, margine interdum dentatis. *Stamina* subulata, uniformia, perianthii fere dimidio breviora.

88. *All. narcissiflorum*, scapo nudo tereti, foliis linearibus obtusis, spathâ bivalvi pedunculis breviore, umbellâ pauciflorâ inclinatâ, perianthii ellipticis acutis, staminibus uniformibus perianthii fere dimidio brevioribus.

Allium narcissiflorum, Vill. Delph. ii. p. 258. t. 6. Willd. Sp. Pl ii. p. 77. Pers. Syn. i. p. 357. Lap. Fl. de Pyr. abr. p. 181. Spreng Sys. ii. p. 37.
A. grandiflorum, Lam. Encycl. i. p. 68. Suppl. p. 268. Lam. et Decand. Fl. Fr. iii. pt. i. No. 1960.
A. narcissiflorum, var. β minus, floribus majoribus, Trev. All. No. 26.

Hab. in Italia, et in Delphinatu. Floret Julio et Augusto.

Bulbus ovatus, basi radicans, ut in Allio senescenti. *Scapus* nudus, teretiusculus pedalis. *Folia* disticha, linearia, subtus convexa, apice obtusa, scapo breviora. *Spatha* bivalvis longitudine pedunculorum. *Umbella* pauciflora, æstivatione cernua. *Perianthium* magnum, campaniforme, roseum: *laciniis* ovato-lanceolatis, acutis. *Stamina* subulata, uniformia, perianthii fere dimidio breviora. *Capsula* obtuse trigona: *loculis* dispermis.

Obs. The two preceding plants are nearly allied, but the comparative size of the flowers with that of the plants, are sufficient to distinguish them. *Allium narcissiflorum* has not yet flowered in this country that I am aware of.

Sect. 8.—Stamina *uniformia exserta*.

89. *All. suaveolens*, scapo subnudo tereti, foliis linearibus subtus carinatis acutis glaucis, spathâ bivalvi, umbellâ globosâ confertâ, perianthii laciniis lanceolatis obtusis, staminibus filiformibus perianthio duplo longioribus.

Allium suaveolens, Jacq. Icon. rar. ii. t. 364. Collec. ii. p. 305. Pers. Syn. i. p. 355. Berg. Fl. Bassan. Pyr. ii. p. 156. Trev. All. No. 17. Spreng. Sys. ii. p. 37. Poir. Encycl. Suppl. p. 264.
A. ambiguum, Lam. et Dec. Fl. Fr. v. No. 1955. Poir. Encycl. Suppl. p. 264.
A. serotinum, Lap. Fl. de Pyr. abr. p. 179.
A. graminifolium, Pers. Syn. i. p. 456.
A. ericetorum, Thore. Land. p. 123. Bert. Amœn. Ital. p. 352.
A. graminifolium, staminibus eminentibus, umbella conglobata varicolore, Hall. All. No. 15. Opusc. p. 365.
A. radice simplici, foliis gramineis, umbella sphærica bicolore, ejusd. in Comm. Gœtt. 1752, p. 338. t. 10.
A. aquaticum, Bauh. Pin. 74. Rupp. Jen. p. 154.

Hab. in Gallia. Floret Septembri et Octobri.

Bulbus radici transversali lignoso adnatus. *Scapus* subnudus pedalis v. sesquipedalis teretiusculus, basi folio vaginatus. *Folia* linearia, acuta, glauca, supra plana, basin versus canaliculata, subtus angulata, carinata, pedalia et ultra. *Spatha* bivalvis, acuta, brevis. *Umbella* globosa, æstivatione cernua. *Perianthium* suaveolens, varicolor: *laciniis* lanceolatis, obtusis, interioribus albis, exterioribus purpureis, hinc umbellis ex albo et purpurascenti eleganter variis. *Stamina* perianthio duplo longiora. *Filamenta* filiformia, uniformia. *Antheræ* flavæ. *Capsula* obtuse trigona: *loculis* dispermis.

Var. β *appendiculatum*, (floribus forsan albis), petalis internis basi auriculatis.

Allium appendiculatum, Ramond. ined. Pers. Syn. i. p. 456.
A. ambiguum, var. β, Poir. Encycl. Suppl. p. 264.

90. *All. ochroleucum*, scapo subnudo tereti, foliis linearibus obtusis subtus convexis nervosis, spathâ bivalvi, umbellâ globosâ confertiflorâ, perianthii laciniis ellipticis obtusis, staminibus filiformibus perianthio duplo longioribus.

Allium ochroleucum, Walds. et Kit. Pl. rar. Hung. ii. p. 204. t. 186. Willd. Enum. p. 362. Link. Enum. i. p. 320. Trev. All. No. 18. Spreng. Sys. ii. p. 38. Poir. Encycl. Suppl. p. 265.

Hab. in Hungaria. Floret Junio et Julio.

Bulbi rudimentis emarcidis foliorum tecti, radici transversali lignescenti adnatus. *Scapus* teres, cum angulo obscuro, spithamæus, lævis, folio basi vaginatus. *Folia* pauca (3) disticha erecta subtus convexa, 5 v. 6-nervia basin versus angustata. *Spatha* bivalvis acuminata, brevis. *Umbella* globosa, æstivatione cernua. *Perianthium* erectum, ochroleucum: *laciniis* ellipticis, obtusis, exterioribus brevioribus, nervo dorsali viridi carinatis, apice fornicatis. *Stamina* perianthio duplo longiora. *Filamenta* setacea, ochroleuco. *Antheræ* flavescentes, effœtæ, nigrescentes. *Ovarium* subrotundum v. ovatum. *Stylus* staminibus brevior, teres, albus. *Stigma* acutiusculum.

* * *

SUBDIVISIO I.—Similis divisioni præcedenti, sed bulbis non basi rhizomotosæ repenti adnatis. *Stamina* omnia uniformia. *Plantæ* Americanæ.

SECT. 1.—Ovarium *tricorne ;* scapi *angulati.*

91. *All. cernuum*, scapo nudo, foliis linearibus subtus angulatis acute carinatis, spathâ bivalvi brevissimâ, umbellâ fastigiatâ cernuâ, perianthii laciniis oblongis, staminibus filiformibus perianthio duplo longioribus, capsulis tricornibus.

Allium cernuum, Roth. Nova Pl. Sp. in Ræmin. Archiv. No. 3. p. 40. Cat. Bot. fasc. 2. p. 33. t. 2. Bot. Mag. No. 1324. Ann. Bot. ii. p. 27. Willd. Enum. i. p. 360. Link. Enum. i. p. 319. Torrey. Flora, p. 341.
A. tricorne, Poir. Encycl. Suppl. p. 270.
Cepa cernua, Mænch.

Hab. in America boreale. Floret Julio et Augusto.

Bulbus ovatus, aggregatus, albus. *Scapus* angulatus, uno angulo prominentiore v. subtetragonus, basin versus subsemicylindricus, viridis, pedalis. *Folia* disticha, linearia, supra canaliculata, subtus angulata, oblique carinata, apice obtusa, scapo breviora. *Spatha* bivalvis, brevissima. *Umbella* multiflora, cernua. *Pedicelli* semiunciam longi, angulati. *Perianthium* rubrum, semiapertum: *laciniæ* oblongæ, obtusæ, concavæ; exteriores breviores, nervo dorsali saturatiore carinatæ. *Stamina* perianthio duplo longiora. *Filamenta* filiformia, alba. *Antheræ* oblongæ, luteæ. *Pistilla* stamina æquantia. *Ovarium* tricorne. *Stylus* teres. *Stigma* obtusiusculum. *Capsula* tricornis, corniculis bifidis emarginatisque.

92. *All. stellatum*, scapo nudo, foliis linearibus subtus angulatis acutè carinatis, spathâ bivalvi, umbellâ fastigiatâ, perianthii laciniis oblongis, staminibus setaceis perianthio æqualibus.

Allium stellatum, Bot. Mag. No. 1576.
A. inodorum, Hort. Kew. ed. 1. i. p. 427. Poir. Encycl. Suppl. p. 268.

Hab. in America boreali. Floret Julio.

Bulbus ovatus, albus. *Scapus* subanceps v. inæquangulus. *Folia* disticha, crassiuscula anguste linearia, subtus angulata, acute carinata. *Spatha* bivalvis, ovato-lanceolata, pedicello breviora. *Umbella* fastigiata, multiflora ante anthesin nutans. *Pedicelli* fere unciam longi. *Perianthium* dilute purpureum expansum, stellatum, magnitudine Allii angulosi: *laciniæ* æquilongæ; exteriores ovatæ, acutæ, nervo saturatiore carinatæ; interiores oblongæ, obtusæ. *Stamina* perianthio æqualia interdum longiora. *Filamenta* purpurea, uniformia, setacea. *Antheræ* flavæ. (*Ovarium* obtuse trigonum, tricorne: corniculis bifidis. *Capsula* obcordata, trigona, apice umbilicata, rotunda, ac in marginem minime angustata, fauce lamellulis binis dentiformibus, erectis, alatis. (Gawler.)

Obs. I have not had an opportunity of examining the ovaria or capsules of this plant; but, from Mr Ker's account of them, they do not appear to differ from those of *Allium cernuum.*

SECT. 2.—Scapi *teretes.*

93. *All. Carolinianum,* scapo nudo, foliis linearibus subtus lævibus, spathâ bivalvi, umbellâ fastigiatâ, perianthii laciniis oblongis obtusis, staminibus subulatis perianthio duplo longioribus, capsulis polyspermis.

Allium Carolinianum, Red. Liliac. ii. t. 101. Spreng. Sys. ii. p. 37.

Hab. in Carolina. Floret Julio.

Bulbus ovatus, aggregatus; tunicis externis fuscis, obductus, fibras albas emittens. *Scapus* nudus, teres, semipedalis et ultra, glaucescens. *Folia* linearia, obtusa, subtus convexa, scapo multo breviora. *Spatha* bivalvis, brevis. *Umbella* multiflora, fastigiata. *Pedicelli* breves. *Perianthium* magnitudine Allii senescentis, dilute purpureum: *laciniis* exterioribus ovatis, concaviusculis, obtusis, nervo dorsali saturatiore carinatis, interioribus longioribus obtusioribus. *Stamina* perianthio duplo longiora. *Filamenta* subulata, alba, uniformia. *Antheræ* oblongæ, luteæ. *Pistilla* staminibus breviora. *Ovarium* album, obtuse trigonum. *Stylus* albus, filiformis. *Stigma* acutiusculum. *Capsula* obtuse trigona: *loculis* polyspermis.

OBS. The above subdivision differs from the preceding division in their want of the hard, woody, iris-looking roots at the base of the bulbs, and from this circumstance I have thought it most proper to separate them. It is right, however, to add, that the plants I have made the above observations upon, are all young, and may, after they become more mature, form those woody roots.

MOLIUM.

Divisio VIII.—*Umbella* bulbifera. *Spatha* bi- vel triloba marcescens. *Stamina* subulata, basi dilatata. *Scapi* nudi, centrales. *Folia* lorata vel linearia. *Flores* patentes.

Sect. 1.—Flores *albi;* scapi *triquetri.*

94. *All. paradoxum*, foliis linearibus carinatis, spathâ bivalvi, perianthii laciniis lanceolatis obtusis, staminibus perianthio brevioribus, umbellâ pauciflorâ subproliferâ.

Scilla paradoxa, Fl. Taur. Cauc. Suppl. p. 257. No. 6861.

Hab. in Sibiria. Floret Aprili.

Bulbus ovatus, albus. *Scapus* gracilis, triqueter, 3 v. 4-uncialis, foliis brevior. *Folia* lineari-lorata, acuta, subtus carinata, viridia, plerumque dua. *Spatha* bivalvis, brevis. *Umbella* 3 ad 6-flora, bulbifera, sæpe prolifera; *bulbis* oblongis, viridibus. *Perianthium* album: *laciniis* lanceolatis, obtusiusculis, nervo medio ochroleuco carinatis. *Stamina* perianthio breviora. *Filamenta* subulata, alba. *Antheræ* oblongæ, luteæ.

Obs. This curious little plant was received from Mr Otto of Berlin, some years ago, by Mr Anderson. It appears to me to be the *Scilla paradoxa* of Bieberstein. See Flora Taurico-Caucasia.

Sect. 2.—Flores *lutei;* scapi *teretes.*

95. *All. scorzonerifolium*, foliis linearibus subtus nervosis, spathâ univalvi, umbellâ pauciflorâ, perianthii laciniis ovato-oblongis obtusiusculis, staminibus perianthio paulo brevioribus

Allium scorzonerifolium, Desf. Cat. Hort. Paris. Red. Liliac. ii. t. 99. Poir. Encycl. Suppl. p. 270. Spreng. Sys. ii. p. 35.

Hab. in Europa australi. Floret Junio.

Bulbus ovatus, albus, magnitudine nucis Avellanæ, fibras tenues albas emittens. *Scapus* nudus, fere pedalis, teres, gracilis, basi striatus. *Folia* pauca, plerumque dua, anguste lorata, supra canaliculata, subtus convexa, trinervata, nervis prominentibus, glauca, apice sæpe emarcida. *Spatha* univalvis, ovalis. *Pedicelli* fere unciam longi, spatha longiores. *Umbella* bulbifera, pauciflora. *Perianthium* luteum, magnum, campaniforme: *laciniis* oblongis, obtusiusculis, nervo dorsali viridi carinatis. *Stamina* perianthio paulo breviora. *Filamenta* subulata, lutea. *Antheræ* ovatæ, luteæ. *Pistilla* staminibus paulo breviora. *Ovarium* luteum, sexstriatum. *Stylus* teres, filiformis. *Stigma* obtusiusculum.

SECT. 3.—Folia *latissima* ; scapo *tereti.*

96. *All. magicum*, foliis lato-lanceolatis subtus convexis squamosis scariosis propagine ex alâ, umbellâ bulbiferâ confertâ intermixtâ, sæpissime floribus destitutâ.

Allium magicum, Lin. Sp. Pl. 434. Reich. ii. p. 34. Lam. Encyc. i. p. 66. Suppl. p. 264. Mill. Dict. ed. Mart. No. 7. Willd. Sp. Pl. ii. p. 66. Brot. Fl. Lusit. p. 544. Pers. Syn. i. p. 355. Lam. et Decand. Fl. Fr. v. No. 1962. Lois. Not. p. 55.
A. caule tereti propagine ex ala, Hort. Cliff. 137. Roy. Lugdb. p. 39. Sauv. Monsp. p. 18.
Moly latifolium Indicum, Bauh. Pin. p. 75. Mill. Dict. No. 2.
M. Indicum et Caucason, Ger. Emac. p. 184. Lob. Icon. t. 161.
M. Indicum sive Caucason, Bauh. Hist. ii. p. 569. Park. Parad. p. 141. Chab. Stirp. p. 202. cum duo iconis.
M. Indicum, Clus. Hist. p. 192. Dod. Pempt. p. 685. Trag. Hist. p. 431. f. 1 et 2. Park. Theat. p. 870.
Ornithogalum latifolium bulbiferum, Morr. Hist. ii. c. xiii. sect. iv. t. 13. f. 11.

Hab. in Europa australi.

OBS. I am aware some of the more recent authors have had *Allium nigrum* in view, when speaking of *Allium magicum* ; but it is impossible to distinguish, from their descriptions alone, which of these plants they meant, as both species bear bulbs occasionally at the base of their leaves.

SECT. 4.—Flores *rosei;* scapi *teretes.*

97. *All. Canadense*, foliis angustissime linearibus obtusis, spathâ bivalvi, umbellâ bulbis confertâ, perianthii laciniis ovalibus, staminibus perianthium æquantibus.

Allium Canadense, Lin. Sp. Pl. 431. Lam. Encycl. i. p. 69. Poir. Suppl. p. 269. Reich. ii. p. 39. Mill. Dict. ed. Mart. No. 33. Willd. Sp. Pl. ii. p. 78. Pers. Syn. i. p. 257. Torrey's Fl. i. p. 340.
A. bulbiferum Virginianum, Boerh. Lugdb. ii. p. 146. Kalm. Itin. iii. p. 79. Mill. Dict. No.

Hab. in Virginia et Canada. Floret Junio et Julio.

Bulbus forsan solitarius. *Scapus* nudus, teres, pedalis v. sesquipedalis, lævis. *Folia* linearia, angusta, lævia, obtusa, scapo multo breviora. *Spatha* bivalvis, ovata, mucronata, brevis. *Umbella* bulbifera, pauciflora. *Perianthium* forsan roseum: *laciniis* ovalibus. *Stamina* subulata, perianthium subæquantia. *Umbellæ* bulbis confertis, ovatis, mucronatis, flavescentibus.

98. *All. mutabile*, foliis setaceis acutis, spathâ trivalvi apice mucronatâ, umbellâ multiflorâ, aut cum bulbillis paucíflorâ, perianthii laciniis lanceolatis acutis, staminibus perianthio æqualibus.

Allium mutabile, Mich. Fl. Amer. p. 195. Pers. Syn. i. p. 357. Red. Liliac. iv. t. 240. Poir. Encycl. Suppl. p. 269. Spreng. Sys. ii. p. 37.

Hab. in Georgia Americæ borealis. Floret Maio.

Bulbus ovato-rotundatus, tunicis externis fibroso-reticulatis atris tectus. *Scapus* nudus, teres, gracilis, lævis, viridis, fere pedalia. *Folia* plana, canaliculata, angustissima superne subsetaceo-convoluta, scapo breviora. *Spatha* trivalvis, mucronata. *Umbella* bulbifera, pauciflora, interdum tota bulbifera; *bulbis* parvis, acuminatis. *Pedicelli* semiunciam longi, spathæ fere æquales. *Perianthium* ex albido-roseum: *laciniis* lanceolatis, acutis, cum carino saturatiore instructis. *Stamina* perianthio æqualia, interdum paulo longiora. *Filamenta* subulata. *Stylus* filiformis. *Stigma* obtusiusculum. *Capsula* obtuse trigona: *loculis* monospermis.

99. *All. ambiguum*, foliis lorato-linearibus acutis paulo tortis, spathâ tri- v. quadrilobâ brevi, umbellâ fastigiatâ laxa, perianthii laciniis oblongis obtusis apice crenulatis, staminibus perianthii dimidio brevioribus.

Allium ambiguum, Fl. Græc. t. 327. Prod. i. p. 227.
A. roseum, var. β, Bot. Mag. No. 978.
A. incarnatum, Horn. Hofn. p. 323. Spreng. Sys. ii. p. 35.
A. roseum, Hortulanorum.
A. tenorii, Spreng. Sys. ii. p. 35.
A. cirrhosum, Rauch. Nomen. p. 74.
Moly angustifolium, foliis reflexis, Bauh. Pin. 76. Mill. Dict. No. 6. Morr. Hist. ii. sect. iv. cap. xvi. t. 16. p. 11.
M. angustifolium, foliis contortis, Tourn. Inst. p. 385.
M. serpentinum, Ger. Emac. p. 185. Park. Parad. p. 142. Theat. p. 871. Lob. Icon. t. 160.
M. angustifolium campanulatum, flore roseo nodosum, Cup. Panph. ii. t. 219.

Hab. in Italia et Græcia. Floret Maio et Junio.

Bulbus parvus, rotundus, fuscus, gregarius. *Scapus* pedalis v. sesquipedalis, teres, lævis. *Folia* plana, lorato-linearia, apicem versus attenuata paulo torta, supra canaliculata, glaucescentia, subtus carinata, viridia, margine sub microscopo ciliato-serrulata, sub terrâ vaginantia. *Spatha* tri- v. quadriloba; *lobis* ovatis, mucronatis, longitudine bulborum. *Umbella* subfastigiata, bulbis ovatis, rubro-striatis, conferta. *Pedicelli* teretes, unciam longi. *Perianthium* roseum, magnum, expansum: *laciniis* oblongis, obtusissimis, apice crenulatis. *Stamina* perianthii dimidio breviora. *Filamenta* subulata, compressa, alba. *Antheræ* oblongæ, luteæ. *Pistilla* stamina æquantia. *Stylus* teres, albus. *Stigma* obtusiusculum.

Obs. This plant is common in our gardens, where it is called *Allium roseum*. From the description in Spreng. Syst. ii. p. 35. it would appear that he meant this plant under the name of *Allium Tenorii.*

100. *All. amœnum*, foliis lorato-linearibus acutis, spathâ bi- v. trilobâ brevi, umbellâ pauciflorâ, perianthii laciniis ellipticis apice emarginatis, staminibus perianthii dimidio brevioribus.

Allium carneum, Targ. Top. Ist. Bot. ed. 2. ii. p. 242. t. 6. f. 304.

Bert. Pl. Gen. p. 51. No. 10. Tenore Fl. Napol. p. 159. t. 28. Savi Cent. p. 87.
A. roseum, Lin. Sys. 321. Vill. Delph. ii. p. 252. Mill. Dict. ed. Mart. No. 10. Lap. Fl. de Pyr. abr. 179. Hort. Kew. ii. p. 234. Pers. Syn. i. p. 456. Poir. Encyc. Suppl. p. 264.
A. roseum, var. β, bulbiferum (carneum), Desf. Cat. Hort. Paris, Lam. et Dec. Fl. Fr. iii. pt. i. No. 1957. Poir. Encyc. Suppl. p. 264. et auctorum aliorum.
Moly Pyrenaicum purpureum, Park. Parad. p. 144.
Allio minus angustifolio, flore læte purpureo majore, Cupanii Hort. Cathol.

Hab. in Italia et Gallia. Floret Maio et Junio.

Bulbus rotundus, albus, gregarius. *Scapus* teres, viridis, pedalis lævis. *Folia* lorato-linearia, acuta, supra canaliculata, subtus carinata, basi ½-unciam lata, sub terrâ, vaginantia longitudine scapi. *Spatha* tri- v. quadriloba: lobis ovatis, brevibus. *Umbella* bulbifera, pauciflora. *Perianthium* amœno-roseum, expansum: *laciniis* ellipticis, apice emarginatis. *Stamina* perianthii dimidio breviora. *Filamenta* purpurascentia, subulata, compressa. *Antheræ* oblongæ, fuscescentes. *Pistilla* stamina æquantia. *Stylus* teres, purpurascens. *Stigma* obtusiusculum.

OBS. All authors who have described *Allium roseum* with emarginate petals, evidently mean this plant: both plants have been so often confused together, that it has now become difficult to unravel them. LINNÆUS, in his "Species Plantarum," p. 432, has evidently had in view the true *Allium roseum*, while in his "Systema Vegetabilium," p. 321, he has had this plant. WILLDENOW, in his "Species Plantarum," has copied LINNÆUS's character from the "Systema Vegetabilium," but that he intends *Allium roseum*, is evident from his own description.

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DIVISIO IX.—*Umbella* capsulifera. *Spatha* bi- vel triloba, brevis, marcescens. *Stamina* subulata, basi dilatata. *Scapi* nudi, centrales. *Folia* lorata. *Flores* patentes erecti, rarius campaniformi penduli.

SECT. 1.—Flores *rosei*; scapi *teretes*; folia *linearia connata.*

101. *All. roseum,* foliis lorato-linearibus carinatis, spathâ bi- vel trilobâ, umbellâ laxâ fastigiatâ, perianthii laciniis ellipticis obtusis integerrimis, staminibus perianthio brevioribus.

Allium roseum, Lin. Sp. Pl. 432. Gouan. Hort. Monsp. 166. Lam. et Dec. Fl. Fr. v. No. 1957. Lam. Encyc. i. p. 65. Desf. Fl. Atl. i. p. 287. Bevon. Cent. i. p. 18. Poir. Ital. ii. p. 145. Vivian. Frag. ap. Ann. Bot. i. pt. i. p. 165. t. 2. Willd. Sp. Pl. ii. p. 66. Brot. Fl. Lusit. p. 547. Red. Liliac. iv. t. 213. Fl. Græc. t. 314. Prod. i. p. 223.
A. foliis ensiformibus, radice bulbillis stipata, floribus amplissimis umbellatis, Sauv. Monsp. p. 42.
A. sylvestre, s. Moly minus, roseo amplo flore, Mag. Bot. Monsp. 2. t. 10. Rudb. Elys. ii. p. 166. f. 17. Raii Hist. ii. p. 1124. No. 12.
Moly purpureum Neapolitanum, Park. Par. p. 144.
M. minus angustifolio, flore majore amœno purpureo, Cup. Hort. Cathol.
M. latifolium purpureum Hispanicum, Raii Hist. ii. 1123. No. 6. Park. Parad. 144.

Hab. in Hispania, Gallia australi. Floret Julio.

Bulbus subrotundus, magnitudine cerasi, gregarius: tunicis exterioribus porosis. *Scapus* nudus, teres, lævis, pedalis et ultra. *Folia* lorato-linearia, versus apicem attenuata, acuta, supra canaliculata, subtus carinata patentia, basin scapi involventia et eodem breviora. *Spatha* tri- v. quadriloba: lobis mucronatis, brevibus. *Pedicelli* semiunciam longi. *Umbella* laxa, subfastigiata. *Perianthium* magnum, roseum, expansum: *laciniis* ellipticis, obtusis, integris. *Stamina* perianthii dimidio breviora. *Filamenta* subulata, basin versus dilatata, compressa. *Antheræ* oblongæ, luteæ. *Pistilla* stamina æquantia. *Ovarium* rotundatum. *Stylus* teres. *Stigma* obtusiusculum.

OBS. This plant may be easily distinguished from its congeners, by its umbels being without bulbs, and the laciniæ of the perianth being obtuse and entire, and of a fine rose-colour. *Allium amœnum nobis,* which has also been so often confounded with this plant, has a bulbiferous umbel, and the laciniæ of the perianth emarginate at the top.

102. *All. illyricum*, foliis lorato-linearibus carinatis, spathâ bivalvi, umbellâ laxâ multiflorâ, perianthii laciniis oblongis acutiusculis, staminibus perianthio brevioribus, bulbo solitario.

Allium illyricum, Jacq. Icon. Rar. ii. t. 365. Collect. iii. p. 273. Willd. Sp. Pl. ii. p. 76. Pers. Syn. i. p. 357. Poir. Encyc. Suppl. p. 268.
A. roseum, Host. Synop. 183. quoad descriptio.

Hab. in vineis et olivetis Austriæ littoralis. Floret Junio et Julio.

Bulbus solitarius, rotundatus, tunicâ externâ fuscâ obductus, bulbillis circumdatus. *Scapus* nudus, teres, gracilis, pedalis, viridis. *Folia* lorato-linearia, basi supra canaliculata, subtus carinata, apicem versus attenuata, acuta, recurva vel dependentia, basin scapi involventia, et eodem breviora. *Spatha* bivalvis, brevis, acuta. *Umbella* multiflora, laxa, subfastigiata. *Pedicelli* irregulares, 1 ad 1½ unciam longi, teretes. *Perianthium* pallide roseum, mediocre: *laciniis* oblongis, obtusiusculis, lineolâ dorsali saturatiore carinatis, interioribus obtusioribus. *Stamina* perianthio breviora. *Filamenta* subulata, basi dilatata. *Antheræ* oblongæ. *Stylus* longitudine staminum.

SECT. 2.—Flores *albi*; scapi *teretes*.

103. *All. subhirsutum*, foliis lorato-linearibus carinatis margine ciliatis, spathâ bivalvi, perianthii laciniis oblongis acutiusculis, staminibus perianthii fere dimidio brevioribus.

Allium subhirsutum, Lin. Sp. Pl. 424. Reich. ii. p. 30. Bivon. Cent. i. p. 17. Lam. Encyc. i. p. 65. Poir. Suppl. p. 264. Mill. Dict. ed. Mart. No. 6. Desf. Fl. Atl. i. p. 286. Willd. Sp. Pl. ii. p. 66. Brot. Fl. Lusit. p. 541. Pers. Syn. i. p. 355. Lam. et Dec. Fl. Fr. No. 1956. Fl. Græc. t. 313. Prod. i. p. 223. Hort. Kew. ii. p. 233. Red. Liliac. vi. t. 305. Willd. Enum. i. p. 357. Trev. All. No. 22. Spreng. Sys. ii. p. 36.
A. trifoliatum, Cyr. Pl. Rar. Neapol. Fas. 2. p. 11. t. 3. Rauch. Nom. p. 74.
A. hirsutum, Lam. Fl. Fr.
A. foliis radicalibus subhirsutis, caulinis glabris floribus umbellatis, Hall. All. No. 18. Opusc. p. 368. Monogr. No. 15.
A. foliis lanceolato-linearibus, florum umbella fastigiata, Roy. Lugdb. p. 39.
A. sylvestre s. Moly angustifolium umbellatum, Mag. Bot. Monsp. p. 9.

A. angustifolium umbellatum flore albo, Tour. Inst. p. 385.
Moly angustifolium umbellatum, Bauh. Pin. 75. Mill. Dict. No. 5. Allium Morr. Hist. ii. p. 393. sect. iv. t. 16. f. 7. Cup. Hort. Cathol. p. 146.
M. Dioscoridis parvum quibusdam, Bauh. Hist. ii. p. 568. f. 1. Raii Hist. 1122. No. 7.
M. Dioscoridis, floribus albis, Cam. Hort. p. 102.
M. Dioscorideum putatum, Lob. Icon. t. 160. Adv. p. 59. Ger. Emac. p. 183. Chab. Stirp. p. 204.
M. Dioscorideum Hispanicum, Parks. Parad. p. 145.
M. angustifolium, Dod. Pempt. p. 685.
M. Dioscoridis, Cluss. Hist. i. p. 192. Math. Disc. ii. p. 781. Swert. Florel. t. 92.
Allium saxatile album angustifolium hirsutum, Cup. Panph. 1. ..
Moly, Matth. p. 140. Cam. Epit. p. 498.

Hab. in Italia, Hispania, Gallia, et in Oriente. Floret Junio.

Bulbi rotundati, albi, gregarii. *Scapus* 1 ad 2 pedalis altus, teres, viridis. *Folia* plerumque tria, lorato-linearia, lanceolata, apicem versus attenuata, acuta, supra canaliculata, subtus carinata, basin scapi involventia et eodem breviora. *Spatha* bivalvis, brevis. *Umbella* laxa, subfastigiata, multiflora. *Perianthium* album, expansum: *laciniæ* oblongæ, acutæ vel acutiusculæ; exteriores minores, lineolis dorsalibus fuscescentibus carinatæ. *Stamina* perianthii fere dimidio breviora. *Filamenta* subulata, basi dilatata, alba. *Antheræ* oblongæ, fuscæ: *polline* luteo. *Pistilla* stamina æquantia. *Stylus* teres, albus. *Stigma* acutiusculum. *Capsula* subrotunda, obtuse trigona: *loculis* dispermis.

Var. *β minus*, perianthii laciniis obtusioribus.

Obs. I think the plants figured in Redouté's "Liliacées" and the "Botanical Magazine," belong to var. *β*.

104. *All. Clusianum*, foliis lorato-linearibus carinatis margine ciliatis, spathâ bivalvi, umbellâ laxâ multiflorâ, perianthii laciniis ellipticis obtusissimis, staminibus perianthii fere dimidio brevioribus.

Allium Clusianum, Retz in Litteris, Willd. Sp. Pl. ii. p. 79. Pers. Syn. i. p. 357. Ann. Bot. ii. p. 27. Poir. Encycl. Suppl. p. 270.
A. niveum, Roth. Cat. Bot. fasc. 2. p. 35. Ann. Bot. ii. p. 27.
A. ciliatum, Roth. Nov. Gen. Plant. in Ræmerii Archiv. sur die Bot. No. 3. p. 41. Cyr. Pl. rar. Neop. fasc. 2. t. 6. p. 17. Bot. Mag. No. 774.
A. ciliare, Red. Liliac. vi. t. 311.
Moly angustifolium, floribus majoribus, Bauh. Pin. 76. Morr. Hist. ii. p. 393. sect. iv. t. 16. f. 10.
M. Dioscorideum minus, Park. Par. p. 145.

M. minus, flore albo, Ger. Emac. p. 185. Swert. Florel. t. 60. f. 4.
M. minus, flore orbiculato majori, Bauh. Hist. ii. p. 568. Chab. Stirp. p. 204.
M. minus, Cluss. Hist. p. 192. Raii Hist. 1124. No. 9.

Hab. in Europa australi. Floret Maio et Junio.

Bulbi rotundi, albi, gregarii. *Scapus* pedalis teres, in planta spontanea spithamæa. *Folia* lineari-loriformia, apicem versus attenuata, acuta, subtus carinata, supra canaliculata, glaucescentia, margine ciliata, basin scapi involventia et eodem breviora. *Spatha* bivalvis, pedicellis brevior. *Umbella* laxa, multiflora, in planta spontanea pauciflora. *Pedicelli* 1½ unciam longi, teretes. *Perianthium* album, expansum: *laciniæ* oblongæ, obtusissimæ; exteriores minores. *Stamina* perianthii fere dimidio breviora. *Filamenta* subulata, basi dilatata, alba. *Antheræ* oblongæ, fuscæ: *polline* luteo. *Pistilla* stamina æquantia. *Ovarium* virescens. *Stylus* teres, albus. *Stigma* acutiusculum. *Capsula* subrotunda, obtuse trigona: *loculis* mono- vel dispermis.

Obs. This plant is more common than the preceding, and is often called in our gardens *Allium subhirsutum.* It may be easily known by its very obtuse petals.

105. *All. Chamæmoly*, fere exscapum; foliis lorato-linearibus carinatis ciliatis, umbellâ pauciflorâ, perianthii laciniis lanceolatis acutis, staminibus perianthii fere dimidio brevioribus, capsulis cernuis.

Allium Chamæmoly, Lin. Sp. Pl. 433. Reich. ii. 42. Lam. Encycl. i. p. 71. Poir. Suppl. p. 272. Mill. Dict. ed. Mart. No. 43. Willd. Sp. Pl. ii. p. 83. Bot. Mag. No. 1203. Cav. Icon. iii. p. 4. t. 207. f. 1. Desf. Fl. Atl. i. p. 288. Pers. Syn. i. p. 358. Lam. et Dec. Fl. Fr. iii. pt. i. No. 1965. Bivon. Cent. i. p. 19. Prod. Fl. Græc. i. p. 227. Spreng. Sys. ii. p. 37.
Moly humile folio gramineo, Bauh. Pin. 75. Rudb. Elys. ii. p. 166. f. 15. Raii Hist. 1124. No. 14. Morr. Hist. ii. cap. xvi. sect. iv. t. 16. f. 8. Cup. Hort. Cathol. p. 147.
Chamæmoli, an Moly Dioscoridis, Colum. Ecphr. p. 326.
A. acaule, seu pinni in superficie florens gramineo folio hirsuto, Cup. Panph. i. t. 242.

Hab. in Italia, Hispania, et Gallia. Floret Aprili.

Bulbus ovatus, parvus, fuscus. *Scapus* teres, subnullus, terrâ immersus. *Folia* lorato-linearia, versus apicem attenuata, supra canaliculata, subtus carinata, 6 vel 7 uncias longa, margine connaque ciliata, sub terra vaginantia. *Spatha* brevis. *Umbella* pauciflora. *Pedicelli* teretes, fere unciam longi, post florescentiam tortuosi. *Perianthium* album, erectum, expansum: *laciniæ* lanceolatæ, exteriores acutiusculæ, interiores obtusiores. *Stamina* subulata, perianthio multo breviora. *Capsula* rotundata, cernua, obtusè trigona: *loculis* dispermis.

106. *All. Græcum*, foliis lorato-linearibus elongatis carinatis ciliatis, spathâ univalvi amplâ ovatâ, umbellâ laxâ fastigiatâ, perianthii laciniis ovalibus acuminatis, staminibus perianthio brevioribus, pedunculis filiformibus.

Allium Græcum, Urville in Lin. Trans. Paris, i. No. 306. Spreng. Sys. ii. p. 36.
A. subhirsutum, Fl. Græc. t. 313. Prod. i. p. 223.

Hab. in Insula Melo frequens. Floret Aprili.

Simillimum Allio subhirsuti; differt tamen spathâ ampliore univalvi, pedicellis multo gracilioribus, petalis acutis, et floribus sæpe roseis.

107. *All. brachystemon*, foliis lorato-linearibus (an carinatis) glabris, spathâ bivalvi, umbellâ laxâ pauciflorâ, perianthii laciniis lanceolatis acutis, staminibus multo longioribus.

Allium brachystemon, Red. Liliac. vii. t. 374.

Hab. in Gallia australi.

Bulbus rotundus, solitarius, parvus, albus. *Scapus* nudus, teres, glaber. *Folia* pauca, plerumque dua, lorato-linearia, glabra (forsan carinata). *Spatha* bivalvis, lanceolata, pedicellis subæqualia. *Umbella* pauciflora. *Perianthium* album, expansum: *laciniæ* lanceolatæ, concavæ, acutæ, maculâ transversali ad basin notatæ. *Stamina* ovarium depressum subæquantia. *Filamenta* subulata, tribus longioribus. *Antheræ* oblongæ, luteæ. *Pistilla* stamina superantia. *Stylus* filiformis. *Stigma* acutiusculum.

Obs. This plant comes near to *Allium subhirsutum*, from which it may be easily distinguished by its smooth leaves.

108. *All. longifolium*, foliis lorato-linearibus obscure striatis tenuissime membranaceis, spathâ bivalvi reflexâ,

umbellâ subretiflorâ, perianthii laciniis lanceolatis, staminibus perianthio brevioribus.

Schænoprasum longifolium, Kunth. Nov. Gen. et Sp. Pl. i. p. 277. Prod. i. p. 284.
Allium longifolium, Spreng. Sys. ii. p. 38.

Hab. in Mexico. Floret Augusto.

Bulbus subglobosus, magnitudine cerasi majoris, tunicatus, basi fibris numerosis. *Folia* angustè linearia, plana, obscurè striata, glabra, basi valde dilatata, et tenuissime membranacea, octo aut novem pollicaria, lineam lata. *Scapus* erectus, teres, striatus, glaber, sex-pollicaris. *Umbella* sub-octoflora. *Flores* pedicellati. *Pedicelli* subæquales, glabri, patuli, floriferi, pollicares, fructiferi, sesquipollicares. *Spatha* bifida, reflexa: *laciniis* ovato-lanceolatis, acuminatis, striatis, emarcidis, glabris, semipollicaribus. *Calycis lacinia* lanceolata. *Stamina* calyce breviora. *Filamenta* subulata. *Capsula* oblonga, magnitudine pisi minoris. *Semina* angulata, nigra. Kunth, l. c.

109. *All. Kunthii*, foliis angustè lorato-linearibus tenuissimè membranaceis, spathâ pedicellis multo breviore, perianthii laciniis oblongis acutiusculis, staminibus perianthium æquantibus patulis.

Schænoprasum lineare, Kunth. Nov. Gen. et Sp. Pl. i. p. 277. Prod. i. p. 284.

Hab. in Nova Hispania. Floret Septembri.

Bulbus ovatus, magnitudine cerasi, basi fibris numerosis. *Folia* anguste linearia, plana, striata, glabra, basi tenuissime membranacea, vaginantia, quadripollicaria. *Scapus* erectus, teres, striatus, glaber, quinque- aut sexpollicaris. *Umbella* 12 aut 15 flora. *Flores* pedicellati. *Pedicelli* teretes, glabri, septem aut octo lineas longi. *Spatha* ovata, lanceolata, marcida, striata, glabra, pedicellis duplo brevior, reflexa. *Calycis laciniæ* oblongæ, acutiusculæ, patulæ, albidæ, media linea rubra longitudinali. *Stamina* longitudine calycis. *Filamenta* glabra, subulata. *Antheræ* oblongæ, *polline* griseo. *Ovarium* ovatum, trigonum. *Stylus* stamina subæquans. Tota planta Allium spirat. Kunth, l. c.

OBS. I have not seen the two preceding plants.

110. *All. Majale*, foliis lorato-linearibus carinatis, spathâ tri- vel quadrilobâ brevi, umbellâ multiflorâ fastigiatâ compactâ, perianthii laciniis ellipticis obtusis, staminibus perianthio multo brevioribus.

Allium Majale, Cyrill. Pl. rar. Neop. fasc. i. p. 13. t. 4. Fl. Napol. i. p. 160. t. 29. Prod. p. 50. Synop. Nova Pl. Neop. p. 40.

Hab. in regno Neopolitano.

Bulbus rotundatus, basi bulbillis circumdatus. *Scapus* nudus, teres, lævis, sesquipedalis et ultra. *Folia* lorato-linearia lanceolata, apicem versus attenuata, supra canaliculata, subtus convexa carinata longitudine caulis vel interdum breviora, basi ½-unciam lata, basin scapi involventia, glabra. *Spatha* tri- vel quadrivalvis, brevis, ovata, acuta. *Umbella* subfastigiata, multiflora, compacta. *Pedicelli* teretes, fere unciam longi. *Perianthium* album, expansum, erectum, externum, subnutans: *laciniis* ellipticis, obtusis, integerrimis. *Stamina* perianthio multo breviora. *Filamenta* subulata, basi dilatata. *Antheræ* oblongæ, luteæ. *Pistilla* longitudine staminum. *Stylus* teres, subulatus, albus. *Stigma* obtusiusculum.

OBS. *Species sequentes non satis notæ, sed evidenter ad duas sectiones præcedentes pertinere videntur.*

111. *All. siculum*, foliis longissime loriformibus, spathâ subnullâ, umbellâ laxâ fastigiatâ, radiis inæqualibus, perianthii laciniis ovatis acutis, exterioribus latioribus, staminibus perianthio brevioribus.

Allium siculum, Ucr. ex Spreng. Sys. ii. p. 36.

Hab. in Sicilia.

Perianthium campanulatum, album.

112. *All. Chinense*, foliis teneribus triangularibus, umbellâ fastigiatâ, staminibus simplicibus.

Allium triquetrum, Lour. Cochin. p. 202.

Hab. in China et Cochinchina.

Bulbus oblongus, parvus, albus. *Scapus* fere pedalis, foliis subæqualis. *Flores* dilute violacea.

113. *All. Sulvia*, foliis late linearibus planis glabris, scapo tereti lævi, umbellâ patulâ multiflorâ. D. Don, Prod. Fl. Nep. p. 53.

Hab. ad Suembu in Nepalia Superiore, Hamil. Floret Julio.

Scapus pedalis. *Folia* lorata, viridia. *Flores* parvi. D. Don, l. c.

114. *All. Thunbergii*, foliis linearibus canaliculatis, subtus angulatis, umbellâ pauciflorâ fastigiatâ.

Allium odorum, Lour. Cochin. p. 203. Thunb. Fl. Jap. p. 132.

Hab. in China et Cochinchina. Lour. in Koraedo, Thunb. Floret Octobri.

Bulbus ovatus, simplex, albus. *Scapus* spithamæus, foliis paulo brevior. *Flores* violacei.

115. *All. Tinei*, foliis linearibus erectis, spathâ brevi, umbellâ pauciflorâ, perianthii laciniis oblongis obtusis, staminibus perianthio brevioribus.

Allium Tinei, Presl. Spreng. Syst. ii. p. 38.

Hab. in Sicilia.

116. *All. triflorum*, scapo nudo tereti foliis breviore, foliis plerumque tribus cuneiformi-lanceolatis multinerviis, umbellâ pauciflorâ.

Allium triflorum, Raff. in Amer. Med. Repos. vi. p. 362. Pursh. Fl. Septent. Amer. i. p. 222. Torrey's Flora, i. p. 341.

Hab. in America boreali.

Sect. 3.—Flores *albi;* scapi *teretes;* stamina *exserta.*

117. *All. microcephalum*, foliis lorato-linearibus, subtus planis bifidis incurvis, spathâ brevi, umbellâ globosâ compactâ, perianthii laciniis acutiusculis, staminibus subexsertis.

Allium microcephalum, Tausch. Oper. ex Spreng. Sys. ii. p. 38.

Hab. in Bohemia.

118. *All. Caspium*, foliis lorato-linearibus undulatis, umbellâ multiflorâ subfastigiatâ medio convexâ aut subglobosâ, perianthii laciniis lineari-lanceolatis acutiusculis, staminibus perianthio duplo longioribus.

Allium Caspium, Fl. Taur. Cauc. i. p. 265. Suppl. p. 260.
Amaryllis Caspia, Willd. Sp. Pl. ii. p. 62.
Crinum Caspium, Pall. Itin. 2. Appen. No. 105. t. 2.
Allium undulatum, Fisher ex Steudel. Nomencl.

Hab. in deserta ad Astracan et Tozzier. Floret Aprili.

Bulbus ovatus, tunicis externis purpurascentibus. *Scapus* nudus, teres, ½ ad pedalis. *Folia* lineari-lanceolata, longitudine scapi, sub terra vaginantia. *Spatha* bivalvis, brevis. *Umbella* subfastigiata, medio convexa, aut subglobosa. *Pedicelli* unciam longi et ultra. *Perianthium* albo-incarnatum, magnum: *laciniis* lineari-lanceolatis, acutiusculis. *Stamina* perianthio duplo longiora. *Filamenta* teretia, subulata. *Capsula* obtuse trigona: *loculis* 1 vel 2-spermis. *Planta* facie amaryllidis.

Obs. An verum Allium nec quidam ultra cum Crino et Amaryllide commune habet quam quod sit Liliacea. Odor et sapor Cepæ vulgaris.—Bieb. Fl. Taur. Cauc. l. c.

Sect. 4.—Flores *albi*; scapi *semiteretes*.

119. *All. Gouanii*, foliis lorato-linearibus acutis margine ciliatis, spathâ univalvi pedicellis breviore, umbellâ fastigiatâ multiflorâ, perianthii laciniis oblongis obtusis, staminibus perianthio brevioribus.

Allium Gouanii, Bot. Reg. No. 758. Spreng. Sys. ii. p. 36.

Hab. in Chili. Floret Maio et Junio.

Bulbus ovatus, albus, gregarius, magnitudine cerasi minoris. *Scapus* semiteres, lævis, pedalis. *Folia* lineari-lanceolata, loriformia, apicem versus attenuata, acuta, supra canaliculata, subtus carinata, margine ciliata, basin scapi involventia, et eodem breviora. *Spatha* univalvis, pedicellis brevior. *Umbella* fastigiata, multiflora. *Pedicelli* fere unciam longi, inæquales. *Perianthium* album, expansum, magnitudine Allii subhirsuti et similis: *laciniis* oblongis, obtusis, interioribus angustioribus. *Stamina* perianthio multo breviora. *Filamenta* subulata, basi dilatata, alba. *Stylus* teres, albus, longitudine caulis. *Stigma* obscure bilobum. *Ovarium* album.

Sect. 5.—Flores *albi*; scapi *triquetres*; stigmata *trifida*.

120. *All. Neopolitanum*, foliis lorato-lanceolatis carinatis, spathâ univalvi brevi amplexa, umbellâ fastigiatâ multiflorâ, perianthii laciniis oblongis obtusissimis, apice crenulatis undulatis, staminibus perianthii fere dimidio brevioribus.

Allium Neapolitanum, Cyr. Pl. rar. Neapol. fasc. i. p. 13. t. 4.
A. album, Bivon. Cent. i. p. 16. Sav. App. Santi Viagg. i. p. 352. t. 7. Ejus Bot. Etrusc. ii. p. 211. Sebas. et Maur. Fl. Rom. Prod. p. 395. Bert. Pl. Gen. p. 51. Savi, Pis. i. p. 340. Lois. addit. Gall. p. 56. Lam. et Dec. Fl. Fr. Suppl. p. 317. No. 1956. Red. Liliac. v. t. 306. Poir. Encycl. Suppl. p. 270. Trev. All. No. 20.
A. lacteum, Fl. Græc. t. 325. Prod. i. p. 226.
A. candidissimum, Cav. Præl.
A. liliflorum, Zexher. Hort. Schwet. anno 1819, p. 15.
Moly caule triangulo, Tour. Inst. p. 384. Roy. Ludb. p. 39.
M. parvum, caule triangulo, Bauh. Pin. 75. Morr. Hist. ii. sect. iv. t. 16. f. 9.
M. parvum Pisavense, Poni. et Bald. Ital. p. 22.
M. album angustifolium Pisarense, caule triangulo, Morr. Hist. ii. p. 394. sect. iv. t. 16. f. 9.
M. Italicum album, caule triangulo, Park. Theat. p. 873.

Hab. in regno Neapolitano, Gallia, Græcia. Floret Aprili.

Bulbus rotundus, magnitudine nucis Avellanæ ac major. *Scapus* triangularis, lævis, pedalis, ad sesquipedalis, in plantâ spontaneâ tantum semipedalis. *Folia* lorata, lineari-lanceolata, supra canaliculata, subtus acute carinata, glabra, versus apicem attenuata, acuta, basin scapi involventia, et eodem breviora. *Spatha* univalvis, amplexa, pedicellis multo breviora. *Umbella* multiflora, sæpe 20 ad 25, fastigiata, in planta spontanea pauciflora. *Pedicelli* trigona, fere 2-uncias longi. *Perianthium* album, expansum, erectum: *laciniis* oblongis, obtusis, apice undulatis, crenulatis, mediâ lineâ ochroleuca instructis, persistentibus, siccitate, hyalinis. *Stamina* perianthii fere dimidio breviora. *Filamenta* subulata basi dilatata, compressiuscula, alba. *Antheræ* oblongæ, virescentes, luteæ. *Pistilla* stamina superantia. *Germen* rotundatum, obtuse trigonum. *Stylus* teres, albus. *Stigma* capitatum, obscure trilobum.

Obs. Dr Treviranus seems to have confounded this plant with *Allium pendulinum* of Tenore, which is a very different species, the flowers being always pendulous, and

the laciniæ of the perianth perfectly acute and entire: indeed, TENORE has described the petals as obtuse; while, in his figure, and in the plants received from him, they are otherwise.

121. *All. triquetrum*, foliis triquetris valde carinatis, spathâ bivalvi brevi, umbellâ multiflorâ, floribus nutantibus, perianthii laciniis oblongo-lanceolatis obtusiusculis, staminibus perianthii fere dimidio brevioribus.

Allium triquetrum, Lin. Sp. Pl. 431. Gouan. Illus. 24. Obs. Itin. p. 51. Reich. ii. p. 40. Lam. Encycl. i. p. 69. Poir. Suppl. p. 270. Bot. Mag. No. 869. Mill. Dict. edit. Mart. No. 35. Lap. Fl. de Pyr. abr. p. 182. Desf. Fl. Atl. i. p. 287. Willd. Sp. Pl. ii. p. 80. Brot. Fl. Lusit. i. p. 547. Pers. Syn. i. p. 357. Biv. Cent. p. 18. Savi, Pis. i. p. 346. Bert. Pl. Gen. p. 51. Lam. et Decan. Fl. Fr. iii. pt. i. No. 1959. Fl. Græc. t. 324. Prod. i. p. 226. Hort. Kew. ii. p. 238. Red. Liliac. vi. t. 319. Spreng. Sys. ii. p. 38.
A. peregrinum, floribus albo-viridibus, Tour. Inst. p. 384.
A. caule triangulo, Tour. Inst. p. 385. Roys. Ludb. p. 39.
A. pratense, folio gramineo, flore prorsus albo, radice oblonga, Rudb. Elys. ii. p. 159. f. 16.
Moly exoticum, floribus albo-viridibus, Bauh. Pin. 75. Morr. Hist. ii. p. 393. sect. iv. t. 16. f. 6.
M. caule et foliis triangularibus, Park. Parad. 142. t. 143. f. 4. Mill. Dict. No. 20.
M. flore albo, lineis viridi colore, Swert. Floret. t. 60. f. 3.

Hab. in Hispania, Gallia, Græcia. Floret Aprili et Maio.

Bulbus ovatus, albus, aggregatus. *Scapus* erectus, profunde triqueter, pedalis et ultra. *Folia* Sparganii, triquetra, ensiformia, apicem versus attenuata, acuta, supra canaliculata, subtus valde carinata, læte viridia, scapo longiora. *Spatha* bivalvis, valvis lanceolatis, acutis, reticulatis, longitudine dimidii pedicellorum. *Umbella* multiflora. *Pedicelli* triquetres, curvati, apice incrassati. *Perianthium* pendulum, album, campaniforme: *laciniis* oblongo-lanceolatis, obtusiusculis, sæpissime mucronatis, lineâ intense viridi carinatis. *Stamina* inæqualia, perianthii fere dimidio breviora. *Filamenta* subulata, subteretia, viridi-alba, alterna, supra basin perianthii laciniarum inserta. *Antheræ* oblongæ, luteæ: *polline* ochroleuco. *Pistilla* staminibus multo breviora. *Ovarium* depressum, viride. *Stylus* teres, albus. *Stigma* profunde tripartitum. *Capsula* obtuse trigona: *loculis* dispermis.

122. *All. medium*, foliis lorato-linearibus planis obtuse carinatis, spathâ bivalvi, umbellâ multiflorâ, floribus nutantibus, perianthii laciniis oblongis obtusiusculis, staminibus perianthii fere dimidio brevioribus.

Hab. in Hungaria. Floret Maio.

Simile Allio triquetro, sed foliis lato-linearibus planis nec triquetris.

Obs. This plant was received by Mr Anderson under the name of *Allium triquetrum*.

123. *All. pendulinum*, foliis lorato-linearibus valde carinatis, spathâ bivalvi brevi, umbellâ pauciflorâ, floribus pendulis, perianthii laciniis oblongo-lanceolatis acutis, staminibus perianthii fere dimidio brevioribus.

Allium pendulinum, Fl. Neap. i. p. 168. t. 31. Prod. p. 22. Synop. Nov. Pl. Neap. p. 40.

Hab. in Italia. Floret Aprili et Maio.

Bulbus ovato-rotundatus, albus. *Scapus* profunde triqueter, 7–9-uncias altus. *Folia* pauca lorato-linearia, apicem versus attenuata, acuta, supra canaliculata, subtus valde carinata, scapo paulo longiora. *Spatha* biloba; lobis lanceolatis, acutis, fere longitudine pedunculorum. *Umbella* pauciflora 6 ad 10 vel 12. *Pedicelli* triquetri, sesquiunciam longi, curvati, apice incrassati. *Perianthium* album, basi viride, pendulum, campaniforme: *laciniis* oblongo-lanceolatis, acutis lineâ intense viridi carinatis, cum nervis duobus lateralibus viridibus. *Stamina* perianthii fere dimidio breviora. *Filamenta* teretiuscula, alba. *Antheræ* oblongæ, luteæ. *Stylus* teres, albus, longitudine staminum. *Stigma* prope tripartitum, album. *Ovarium* sexstriatum.

Obs. This plant is nearly allied to *Allium triquetrum*, the laciniæ of the perianth being perfectly acute, and the alternate stamens not inserted above the base of the perianth. There are seldom more than two leaves to each bulb.

SECT. 6.—Scapi *teretes;* stamina *basi connata;* flores *albi, purpurei, cœrulei;* folia *lata, subtus non carinata.*

124. *All. nigrum*, foliis lato-loriformibus, spathâ tri- vel quadrilobâ, umbellâ fastigiatâ multiflorâ, perianthii laciniis lanceolatis obtusis, staminibus perianthii fere dimidio brevioribus.

Allium nigrum, Lin. Sys. 323. Willd. Sp. Pl. ii. p. 78. Pers. Syn. i. p. 357. Poir. Encycl. Suppl. p. 269. Lam. et Dec. Fl. Fr. iii. pt. i. No. 1962. Fl. Græc. t. 323. Prod. i. p. 226. Fl. Taur. Cauc. i. p. 266. No. 658. Hort. Kew. ii. p. 238. Bot. Mag. No. 1148. Willd. Enum. i. p. 361. Red. Liliac. ii. t. 102. Fl. Taur. Cauc. Suppl. p. 261.
A. multibulbosum, Mur. Sys. 323. Jaq. Aust. i. p. 9. t. 10. Lin. Sys. p. 323.
A. monspessulanus, Gouan. Illus. 24. t. 16. Fl. Atl. i. 286.
A. decipiens, Fisher. Hort. Gorink. anno 1812, p. 10.
A. magicum, Lam. Encycl. i. p. 69. Brot. Fl. Lus. i. p. 544. Spreng. Sys. ii. p. 36.
A. speciosum, Cyrill. Pl. rar. Neap. fasc. ii. p. 13. t. 5. f. 2.
A. subalpinum, Pall. ined. ex Steud. Nomencl.
A. foliis caulinis lanceolatis, floribus umbellatis, ex ala bulbiferum, Hall. All. No. 22. Opusc. p. 382. Monogr. No. 19.
Moly latifolium, Eryst. Æst. 4. p. 11. f. 2. Dod. Pempt. p. 685.
Allium montanum bicorne latifolium, flore magno dilute purpurascente, Rud. Elys. ii. p. 160. f. 21.
Moly latifolium Hispanicum, Bauh. Pin. 75. Morr. Hist. ii. p. 393. sect. iv. t. 16. f. 1. Mill. Dict. No. 3.
M. latifolium liliflorum, Bauh. Pin. 75. Mill. Dict. No. i.
M. Cyprium Theophrasti, Bauh. Pin. 72.
M. latifolium flore albo, Rupp. Jen. ed. 2. p. 122.
M. Theophrasti magnum, Bauh. Hist. ii. p. 568. Raii Hist. 1122. No. 2. Chab. Stirp. p. 204.
M. Indicum flore purpureo, Swert. Floret. t. 61.
M. Homericum, Cæsalp. p. 404. Ger. Emac. p. 183.
M. Theophrasti, sive Homericum, Park. Parad. 141. Theat. 871.
M. liliflorum, Lob. Adv. p. 82.
M. liliflorum, sive Homericum forte bulbum in folio gerens, Lob. Icon. t. 161.
M. montanum latifolium purpurascens Hispanicum, Park. Parad. p. 144.
M. Theophrasti, Clus. Hist. i. p. 191.

Hab. in Gallia, Italia, Tauria, Austria, Lusitania, et Oriente. Floret Junio et Julio.

Bulbus rotundatus, albus, bulbillis numerosis circumdatus. *Scapus* teres, lævis, viridis, crassitudine pennæ anserinæ, 2–3-pedalis et altior. *Folia* lorata, lato-lanceolata, acuta, humi-patentia, supra canaliculata, subtus convexa, basin scapi involventia, et eodem multo breviora. *Spatha* bi- ad quadriloba; lobis mucronatis, longitudine medio pedunculorum. *Umbella* fastigiata, multiflora, medio convexa, expansa. *Pedicelli* teretes, fere biuncias longi. *Perianthium* album, expansum, magnum: *laciniæ* lanceolatæ, obtusæ, alternæ magis concavæ, lineolis mediis viridibus carinatæ. *Stamina* perianthii dimidio breviora. *Filamenta* subulata, alba, compressiuscula, basi membrano lato connexa. *Antheræ* oblongæ, ochroleucæ: *polline* ochroleuco. *Pistilla* longitudine staminum. *Ovarium* subrotundum, nigro-fuscum, sexstriatum. *Stylus* teres, albus. *Stigma* acutum. *Capsula* obtuse trigona: *loculis* bi- v. sæpe tetraspermis.

OBS. There is a pale red variety of this plant, (see Flora Græca, Swert., Parkinson l. c., &c.); but I think this variation of colour is owing to the climate in which it is flowered. RUDBECK's plant also belongs to this variety.

125. *All. atropurpureum*, foliis lorato-lanceolatis, spathâ bi- ad quadrilobâ, umbellâ fastigiatâ multiflorâ, perianthii laciniis linearibus obtusis, staminibus perianthio brevioribus.

Allium atropurpureum, Walds. et Kit. Pl. rar. Hung. i. p. 16. t. 17. Horn. Hafn. p. 324. Spreng. Sys. ii. p. 36.

Hab. in Hungaria. Floret Junio.

Bulbus ovatus, albus, bulbillis numerosis circumdatus ut in Allio nigro. *Scapus* teres, lævis, nudus, bipedalis et ultra, crassitudine pennæ corvinæ. *Folia* lineari-lanceolata, loriformia, acuta, basi purpurascens, supra canaliculata, subtus convexa, pedalem longa, humi patentia, sub terra vaginantia, margine sub microscopo scabro-serrulata. *Spatha* bi- ad trivalvis, brevia, basi connata. *Umbella* fastigiata, multiflora, expansa, medio leviter convexa. *Pedicelli* unciam longi, viridi-purpurei, teretes. *Perianthium* expansum, atropurpureum: *laciniis* linearibus obtusis, lineâ mediâ viridi carinatis. *Stamina* perianthio breviora. *Filamenta* atropurpurea, basi pallidiora, et latiora membrano lato connexa. *Antheræ* atropurpureæ, defloratæ fuscescentes. *Pistilla* fere longitudine staminum. *Ovarium* subrotundum, sexstriatum, viride. *Stylus* teres, atropurpureus. *Stigma* acutiusculum. *Capsula* obtuse trigona: *loculis* dispermis.

Obs. This plant is in habit like the preceding. The colour of the flowers, the narrow laciniæ of the perianth, and narrower leaves, seem to be the only characters which it differs in.

126. *All. cœruleum*, foliis brevibus loratis obtusis, spathâ bivalvi, umbellâ fastigiatâ multiflorâ, perianthii laciniis linearibus obtusis, staminibus perianthium fere æquantibus.

Allium cœruleum, in Herb. Lamb. Rauch Nom. p. 74.

Hab. in Rossia.

Bulbus rotundus, albus. *Scapus* nudus, teres, lævis, bipedalis et ultra, solidus. *Folia* lorato-lanceolata, obtusa, brevia, recurva, supra canaliculata, subtus convexa, lævia, sub terra vaginantia. *Spatha* bivalvis, mucronata, fere longitudine pedunculorum. *Umbella* fastigiata, multiflora, expansa, medio convexa. *Pedicelli* unciam longi et ultra. *Perianthium* expansum, cœruleum, stellatum: *laciniis* linearibus, obtusis. *Stamina* perianthium subæquantia. *Filamenta* subulata, compressa, basi latiora membrano lato connexa, expansa, stellata. *Stylus* teres, longitudine staminum vel interdum iisdem longior. *Stigma* obtusiusculum. *Capsula* acute trigona: *loculis* 1 vel 2-spermis.

127. *All. tuberosum*, foliis lorato-linearibus flaccidis, spathâ bivalvi, perianthii laciniis oblongis obtusis, staminibus perianthium æquantibus, umbellâ fastigiatâ multiflorâ.

Allium tuberosum, Rottl. in Spreng. Sys. ii. p. 38.

Hab. in Malabaria.

Bulbus ? *Scapus* nudus, teres (anceps), lævis, solidus, bipedalis et ultra. *Umbella* fastigiata, multiflora, medio paululum convexa. *Spatha* bivalvis, brevis (caduca). *Pedicelli* fere unciam longi, crassi. *Capsula* obtuse trigona: *loculis* 1 rarius dispermis.

Obs. The specimen which I had to examine being imperfect, I am unable to give a further description of this curious plant.

SECT. 7.—Flores *lutei ;* scapi *teretes ;* stamina *basi connata ;* folia *latissima.*

128. *All. Moly,* foliis lanceolatis flaccidis, spathâ bivalvi mucronatâ brevi, perianthii laciniis oblongo-lanceolatis acutis, staminibus perianthii fere dimidio brevioribus, umbellâ fastigiatâ multiflorâ.

Allium Moly, Lin. Sp. Pl. 432. Reich. ii. p. 41. Bot. Mag. No. 499. Mill. Dict. ed. Mart. No. 33. Lap. Fl. de Pyr. abr. p. 182. Willd. Sp. Pl. ii. p. 80. Pers. Syn. i. p. 357. Lam. et Dec. Fl. Fr. iii. pt. i. No. 1964. Willd. Enum. i. p. 36. Hort. Kew. ii. p. 239. Red. Liliac. ii. t. 97. Spreng. Sys. ii. p. 36. Poir. Encycl. Suppl. p. 270.
A. aureum, Lam. Encycl. i. p. 69.
A. flavum, Salisb. Hort. Chap. aller. p. 235.
A. foliis radicalibus sessilibus, lanceolatis floribus umbellatis, Roy. p. 38. Fl. Leid. Prod. p. 57. Hall. Allio, No. 23. Opusc. p. 383. Monogr. No. 20.
A. scapo nudo, foliis lanceolatis sessilibus, umbellâ fastigiatâ, Hort. Ups. p. 79.
A. foliis lanceolatis, umbellâ laxâ, Hort. Cliff. p. 127.
A. floribus e luteo-virescentibus, Tour. Inst. p. 383.
Moly latifolium luteum et alternum, Tour. Inst. p. 384.
M. latifolium luteum, odore Allii, Bauh. Pin. 75. No. 4. et 5. Morr. Hist. ii. p. 393. sect. iv. t. 16. f. 4.
M. Pyrenaicum, flore luteo, Rupp. Jen. ed. ii. p. 122.
M. latifolium, flore flavo, foliis contortis, Morr. Hist. ii. p. 393. sect. iv. t. 16. f.
M. luteum botanicorum latifolium Allii odore, Bauh. Hist. ii. p. 562. Lob. Adv. 502. Chab. Stirp. 204.
M. latifolium, flore flavo, Ger. Emac. p. 185. Raii Hist. ii. p. 1123. No. 4. Mill. Dict. No. 4.
M. flavo flore, Swert. Florel. i. t. 60. p. 2.
M. flore subviridi, Bocc. Pl. rar. 63.
M. montanum luteo flore, Parks. Parad. p. 144.
M. montanum latifolium, flavo flore, Cluss. Hist. App. Atl.

Hab. in Hungaria, Gallia australi. Floret Junio et Julio.

Bulbus rotundatus, fusco-albus, gregarius. *Scapus* subcylindricus, basi subsemicylindricus, vel acute anceps, pedalis, vel sæpe ultra, glaucus. *Folia* lanceolata, acuta, sessilia, glauca, sub terra vaginantia. *Spatha* bivalvis mucronata, pedicellis paulo breviora. *Umbella* multiflora, fastigiata, expansa. *Pedicelli* subcylindrici, glauci, fere unciam longi, apice incrassati. *Perianthium* luteum, patens: *laciniis* ellipticis, acutis, linea viridi carinatis. *Stamina* perianthio multo breviora, patentia. *Fi-*

lamenta teretia, subulata, lutea, basi connata. *Antheræ* oblongæ, luteæ. *Pistilla* longitudine staminum sæpe breviora. *Ovarium* sexstriatum, luteum. *Stylus* teres, luteus. *Stigma* obtusiusculum. *Capsula* obtuse trigona, glauca, perianthio persistente inclusa: *loculis* 1 vel 2-spermis.

129. *All. pulchrum*, foliis lorato-lanceolatis, spathâ bivalvi brevi, umbellâ fastigiatâ multiflorâ laxâ, perianthii laciniis oblongis obtusis, staminibus perianthii fere dimidio brevioribus.

Allium pulchrum, Clark's Travels, ii.

Hab. in Rossia. Floret Junio et Julio.

Bulbus rotundatus, tunicâ fuscâ obductus, gregarius. *Scapus* nudus, teres, pedalis. *Folia* sessilia, lorata, lineari-lanceolata, apicem versus attenuata, acuta, plana, longitudine caulis. *Spatha* bivalvis, ovata, longitudine pedicellorum. *Pedicelli* teretes, fere unciam longi. *Umbella* fastigiata, multiflora, laxa. *Perianthium* luteum, expansum, magnitudine Allii moly: *laciniis* ellipticis, obtusis. *Stamina* perianthio fere dimidio breviora. *Stylus* teres, longitudine staminum. *Capsula* obtuse trigona: *loculis* dispermis.

SECT. 8.—Flores *albi*; scapi *semiteretes*; folia *latissima*.

130. *All. tricoccum*, foliis oblongo-lanceolatis, spathâ bivalvi, umbellâ subfastigiatâ confertiflorâ, perianthii laciniis oblongis obtusis, staminibus perianthio æquantibus.

Allium tricoccum, Hort. Kew. ed. 1. ii. p. 428. Willd. Sp. Pl. ii. p. 81. Pers. Syn. i. p. 358. Pursh Fl. Amer. i. p. 223. Poir. Encycl. Suppl. p. 271. Torrey, Fl. i. p. 341.

Hab. in America boreali. Floret Julio.

Bulbus ? *Scapus* nudus, semiteres, fere pedalis. *Folia* pleraque lanceolato-oblonga, acutiuscula, basi membranâ foliaceâ obvoluta. *Spatha* bivalvis, fere longitudine pedicellorum. *Pedicelli* breves, vix semiunciam longi. *Umbella* confertiflora, subfastigiata, medio convexa. *Perianthium* album: *laciniis* oblongis, obtusis, carina forsan viridi instructis. *Stamina* perianthium æquantibus, interdum paulo superantibus. *Filamenta* subulata. *Stylus* teres, longitudine staminum. *Capsula* acute trigona: *loculis* monospermis.

SECT. 9.—Flores *albi;* scapi *triquetri;* folia *latissima.*

131. *All. ursinum,* foliis elliptico-lanceolatis petiolatis, spathâ bilobâ, pedicellis subæquali, umbellâ fastigiatâ laxâ, perianthii laciniis lineari-lanceolatis obtusiusculis, staminibus perianthio multo brevioribus.

Allium ursinum, Lin. Sp. Pl. 431. Fl. Suec. ed. ii. p. 103. Lin. Syst. p. 323. Mill. Dict. No. 3. Scop. Fl. Carn. i. p. 238. No. 406. Huds. Ang. 140. Fl. Dan. t. 757. Hofm. Germ. 117. Roth. Germ. i. p. 147; ii. p. 385. Mill. Dict. ed. Mart. No. 34. Reid. ii. p. 40. Lap. Fl. de Pyr. abr. p. 182. Willd. Sp. Pl. ii. p. 79. Pers. Syn. i. p. 357. Lam. et Dec. Fl. Fr. iii. pt. i. No. 1966. Fl. Taur. Cauc. i. p. 266. Suppl. p. 262. Willd. Enum. i. p. 361. Fl. Brit. 359. Hort. Kew. ii. p. 238. Red. Liliac. vi. t. 303. Poir. Encycl. Suppl. p. 270. Urville in Trans. Lin. Soc. Paris. i. No. 309. Hook. Scot. 101. Eng. Flor. ii. p. 138. Spreng. Sys. ii. p. 36.
A. petiolatum, Lam. Encycl. i. p. 69.
A. nemorale, Sal. Hort. chap. All. p. 235.
A. foliis radicalibus petiolatis ovato-lanceolatis, floribus umbellatis, Hall. Helv. ii. No. 1228. p. 110.
A. foliis radicalibus latissimis petiolatis, floribus umbellatis, Roy. Prod. Fl. Leid. p. 37. Hall. All. No. 21. Opusc. p. 379. Monogr. No. 18.
A. sylvestre latifolium, Bauh. Pin. 74. Raii Hist. 1122. Mill. Dict. No. 4. Rudb. Elys. ii. p. 152. f. 8.
A. sylvaticum latifolium, Rupp. Jen. ed. 3. p. 152; ed. 2. p. 122.
A. ursinum bifolium vernum sylvaticum, Bauh. Hist. ii. p. 565. Chab. Stirp. p. 303.
A. palustre latifolium, Morr. Hist. ii. p. 388. sect. iv. t. 11. f. 15. Raii Syn. 370.
A. sylvestre latioris folio, seu A. ursinum, Dodon. Pempt. 683.
A. ursinum latifolium, sive Moly hippocraticum, Lob. Adv. p. 59.
A. ursinum latifolium, Lob. Icon. 159.
A. sylvestre, Trag. Hist. p. 748.
A. triquetrum, Cortus. Hort. Patav. ex Hall.
A. ursinum, Fush. Hist. p. 739. Math. Valgr. p. 512. Cam. Epit. p. 330. Hist. 173. Parks. Parad. 514. Ger. Emac. p. 188. Dalech. Hist. 1546. Lob. Obs. p. 80. Clus. Pann. 226. Diosc. Lib. Secund. 272. Math. Opera, 422.
Aglio ursino, Math. Disc. 590.

Hab. in Anglia, Germania, Dania, Gallia, Tauria, Helvetia, Suecia, et Oriente. Floret Aprili et Maio.

Bulbus tenuis, albus, (setis obvolutus). *Scapus* nudus, acute triqueter, nunc semicylindricus, lævis, foliis paulo brevior. *Folia* dua, elliptico-lanceolata, acuta, viridia, 5 vel 6 uncias longa, sesquiunciam lata, petiolata, nervo medio valido, lateralibus reticulatis; petiolis longis, subsemicylindricis vel compressiusculis, sub terra vaginantibus. *Spatha* bivalvis fere longitudine pedicellorum. *Pedicelli* fere unciam longi, triquetri. *Umbella* fastigiata, multiflora, laxa. *Perianthium* album, expansum: *laciniæ* lineari-lanceolatæ, obtusiusculæ. *Stamina* perianthio multo breviora. *Filamenta* subulata, teretia, alba, alterna supra basi perianthii inserta. *Antheræ* oblongæ, luteæ. *Pistilla* staminibus breviora. *Ovarium* turbinatum, trilobum. *Stylus* teres, albus. *Stigma* acutum. *Capsula* obtuse trilobum: *loculis* dispermis.

132. *All. sulcatum*, foliis ellipticis subplicatis, spathâ univalvi cyathiformi, umbellâ fastigiatâ confertiflorâ, perianthii laciniis ovalibus obtusis stamina duplo superantibus.

Allium sulcatum, Red. Liliac. viii. t. 482.

Hab. . . . .

Bulbus ovato-rotundatus, tunicis fuscis obductus. *Scapus* fere pedalis, sæpius semipedalis, triqueter; angulo sulcato. *Folia* elliptica, acuta, subplicata, subtus subangulata, 6 uncias longa, sub terra vaginantia, interdum scapo æqualia. *Spatha* univalvis cyathiformis, in lobis 2 vel 3, sæpe divisa. *Umbella* fastigiata, multiflora, conferta. *Perianthium* album, expansum: *laciniis* ovalibus, obtusis. *Stamina* perianthio breviora. *Filamenta* subulata, alba. *Antheræ* oblongæ, luteæ. *Pistilla* longitudine staminum. *Ovarium* trilobum. *Stylus* teres, albus. *Stigma* acutiusculum.

Obs. This plant is in habit like *Allium tricoccum*.

ANGUINUM.

DIVISIO X.—*Umbella* capsulifera. *Spatha* univalvis, apice 2-fissa. *Stamina* subulato-lanceolata. *Caules* foliosi. *Radix* transversalis lignosa, reticulis obducta.

SECT. 1.—Stamina *exserta;* folia *latissima.*

133. *All. victorialis*, caule basi tereti, superne ancipiti, foliis elliptico-oblongis obtusis subplicatis, spathâ univalvi cyathiformi, umbellâ multiflorâ confertâ.

Allium victorialis, Lin. Sp. Pl. 424. Mill. Dict. No. 7. Reich. ii. p. 30. All. Pedm. i. p. 223. Gært. Fruct. i. p. 56. t. 16. Vill. Dauph. ii. p. 258. t. 6. Bot. Mag. No. 1222. Roth. Germ. ii. p. 380. Jacq. Aust. t. 216. Willd. Sp. Pl. ii. p. 65. Plenk. Icon. t. 261. Brot. Fl. Lus. p. 540. Pers. Syn. i. p. 355. Lap. Fl. de Pyr. abr. p. 181. Lam. et Dec. Fl. Fr. iii. pt. i. No. 1963. Prod. Fl. Græc. i. p. 223. Poir. Encyc. Suppl. p. 264. Willd. Enum. i. p. 357. Hort. Kew. ii. p. 233. Red. Liliac. v. t. 263. Fl. Taur. Cauc. Suppl. p. 256. Spreng. Sys. ii. p. 36.
A. plantagineum, Lam. Encyc. i. p. 65.
A. radice oblonga reticulo obducta, foliis ovato-lanceolatis, umbellâ sphæricâ, Hall. Hist. ii. No. 1229. p. 111.
A. radice oblonga reticulo obducta, Hall. All. No. 20. Opusc. p. 375. Monogr. No. 17.
A. foliis caulinis lanceolatis, floribus umbellatis, Roy. 39.
Moly alpinum latifolium, caule maculato, Rupp. Jen. ed. 3. 152; ed. 2. 122.
Victorialis, Royer, p. 128. Cam. Hort. p. 10.
Allium montanum latifolium maculatum, Bauh. Pin. 74. Morr. Hist. ii. p. 388. sect. iv. t. 15. f. 16. Rudb. Elys. ii. p. 152. Rand. Hort. Chels. p. 9.
A. serpentinum foliis rotundioribus, Bauh. Phyt. p. 106.
A. serpentinum seu Victorialis, Ger. Emac. p. 182. Tab. Icon. 481.
A. serpentinum et Ophioscorodon, Lob. Icon. p. 159. Math. Disc. p. 589.
A. latifolium maculosum, Lob. Adv. p. 59.
Ophioscorodon, Lob. Obs. p. 81.
A. alpinum, Dod. Pempt. 684. Cam. Hort. p. 10. Bauh. Hist. ii. p. 566.
A. alpinum victorialis mas, Chab. Stirp. p. 203.
A. anguinum, Math. p. 559. Cam. Epit. p. 329. Park. Theat. 871. Math. Opera, 422.

Victorialis longa, Cord. p. 97. Cluss. Hist. 189. Pann. 224.
Victorialis femina, Gesn. Epist. p. 117. Mas. Buchw. p. 289.

Hab. in alpibus Helvetiæ, Galliæ, Austriæ, Germaniæ. Floret Maio et Junio.

Bulbus elongatus, cæspitosus, tunicis externis atris reticulatis obductus, basin radicem transversalem lignosam acquirit, fibras numerosas emittens. *Caulis* vix bipedalis, crassitudine pennæ anserinæ vel digiti minoris, fere infra medium foliosus, inferne teres; purpurascens, superne anceps, viridis. *Folia* dua vel tria, elliptico-oblonga, obtusa, subplicata vel nervosa, 6 uncias longa, 2 uncias lata, sæpe ultra, glaucescentia. *Vaginæ* teretes, purpurascentes. *Spatha* univalvis, basi cyathiformis, apice bifissa, umbellâ longior. *Umbella* confertiflora. *Pedicelli* sulcato-angulati, semiunciam longi, basi purpurascentes. *Perianthium* parvum, ochroleucum: *laciniis* interioribus ovatis, obtusis, exterioribus lanceolatis, obtusis, lineâ viridi carinatis. *Stamina* perianthio multo longiora. *Filamenta* subulato-lanceolata, compressa, basi dilatata, cucullata, alba. *Antheræ* oblongæ, luteæ. *Pistilla* longitudine staminum. *Ovarium* triquetrum, virens. *Stylus* teres, albus. *Stigma* obtusum. *Capsula* acute trigona; *loculis* monospermis. *Semina* rugosa.

Var. β, angustifolium, Hall. Helv. l. c.

Victorialis fœmina, Cam. Hort. p. 10.
Allium serpentinum, foliis oblongis, Bauh. Phyt. 106.
A. montanum foliis magnis cinereis, Rudb. Elys. p. 158.
γ, Deinde angustifoliam varietatem, Hall. All. No. 20. var. γ. Opusc. p. 378. cum altera varietate.

Sect. 2.—Stamina *inclusa*; folia *semicylindrica fistulosa.*

135. *All. odorum*, foliis distichis, umbellâ fastigiatâ laxa, perianthii laciniis lanceolatis acutis, staminibus subulatis basi connatis.

Allium odorum, Lin. Mant. p. 62. Syst. 323. Reich. ii. p. 38. Mill. Dict. ed. Mart. No. 29. Willd. Sp. Pl. ii. p. 76. Pers. Syn. i. p. 357. Poir. Encycl. Suppl. p. 268. Willd. Enum. i. p. 361. Trev. All. No. 23. Spreng. Syst. ii. p. 38.
A. tataricum, Lin. Suppl. p. 196. Lin. Sys. 322. Mill. Dict. ed. Mart. No. 11. Willd. Sp. Pl. p. 67. Pers. Syn. i. p. 355. Hort. Kew. ii. p. 233. Red. Liliac. ii. t. 98. Lam. Encycl. i. p. 65. Poir. Suppl. p. 264. Bot. Mag. No. 1142.
A. ramosum, Lin. Sp. Pl. 424. Reich. ii. p. 31. Mill. Dict. ed.

Mart. No. 9. Willd. Obs. Bot. p. 17. Lam. Encycl. i. p. 65. Poir. Suppl. p. 264. Willd. Sp. Pl. ii. p. 67. Pers. Syn. i. p. 355.
A. umbellatum, Hall. Comm. Gœt. ad ann. 1752, p. 437. t. 9 et 10. fig. 2. ejusd. in Hort. Gœt. ed. 2. p. 83.
A. scapo nudo tereti farcto, foliis semicylindricis, staminibus corollâ longioribus, Gmel. Sib. i. p. 52. t. 11. f. 1.

Hab. in Sibiria. Floret Maio et Junio.

Bulbus elongatus, cæspitosus, tunicis externis atris reticulatis obductus, basi radice transversali lignosâ instructus, fibras numerosas emittens. *Scapus* nudus, compressiusculus, fistulosus, lævis, crassitudine pennæ gallinæ, fere bipedalis, foliis duplo longiora. *Folia* semicylindrica, obtusa, angusta, supra canaliculata, subtus convexa, striata, fistulosa, basi in fasciculum connexa, vaginantia. *Spatha* brevis, pedicellis brevior. *Pedicelli* unciam longi, teretes, bracteolis plurimis interjecti. *Umbella* fastigiata, laxa. *Perianthium* album: *laciniis* lineari-lanceolatis, acutis, lineâ rufescente carinatis. *Stamina* perianthio fere dimidio breviora. *Filamenta* subulata, subteretia, supra medium rufescentia, basi dilatata, connata. *Antheræ* oblongæ, fuscæ; *polline* luteo. *Pistilla* longitudine staminum. *Stylus* teres, crassus, albus, vel ochroleucus. *Stigma* acutiusculum. *Capsula* obtuse trigona: *loculis* dispermis.

Obs. The reason I have added *Allium ramosum* of Linnæus as a synonym of his *Allium odorum*, is from his referring to "Gmelin Flora Sibirica," l. c. Gmelin mentions the stamens of his plant as being longer than the perianth, which is not the case in those I have seen; nor in his figure, which is undoubtedly the *Allium odorum*, although the description of Linnæus would agree better with my *Allium ramosum*, which is nearly allied to *Allium obliquum*, and which is also a native of Sibiria. Linnæus perhaps had my plant in view.

ORNITHOGALODEUM.

DIVISIO XI.—*Umbella* capsulifera. *Spatha* bivalvis, vel 3–4 loba, brevis, marcescens. *Stamina* subulata, basi dilatata, inclusa. *Folia* disticha, narcissina. *Scapi* nudi, teretes, centrales. *Bulbi* solitarii. *Plantæ* odore alliaceo destitutæ.

SECT. 1.—Folia *obtusa*.

136. *All. fragrans*, foliis linearibus obscure carinatis, spathâ diphyllâ, umbellâ fastigiatâ pauciflorâ, perianthii laciniis obovatis obtusis concavis, staminibus in tubum connatis, capsulis polyspermis.

Allium fragrans, Vent. Hort. Cels. p. 26. t. 26. Pers. Syn. i. p. 35. Red. Liliac. ii. t. 68. Bot. Reg. No. 898. Poir. Encycl. Suppl. p. 268. Trev. All. No. 21.
A. gracile, Hort. Kew. ed. 1. ii. p. 429. Willd. Sp. Pl. ii. p. 83. Poir. Encycl. Suppl. p. 269.
A. inodorum, Bot. Mag. No. 1129.

Hab. in Virginia, Carolina, Mexico, &c. Floret Maio, Junio, et Julio.

Bulbus ovatus, fusco-suffusus, fibras crassas emittens. *Scapus* pedalis seu sesquipedalis, subteres. *Folia* narcissina, disticha, linearia, obtusa, supra canaliculata, subtus obscure carinata, glaucescentia, scapo multo breviora. *Spatha* diphylla; *lobis* ovato-lanceolatis, acuminatis. *Umbella* fastigiata, laxa, a 9 ad 10 vel 15 flora. *Pedicelli* teretes, unciam longi. *Perianthium* album, semiapertum, basi viride: *laciniis* obovatis, obtusis, concavis, exterioribus longioribus, mediâ lineâ rubro-marmoratâ carinatis. *Stamina* perianthio breviora. *Filamenta* subulata, compressa, basi latiora, in tubum connata perianthio adhærentia, ochroleuca, basin versus viridiuscula. *Antheræ* oblongæ, purpurascentes; *polline* luteo. *Pistilla* longitudine staminum. *Ovarium* obovatum. *Stylus* teres, ochroleucus. *Stigma* subcapitatum, luteum. *Capsula* obovata, magna, obscure trigona: *loculis* polyspermis. *Semina* angulata, disticha.

137. *All. striatum*, foliis linearibus, spathâ bivalvi, umbellâ pauciflorâ, perianthii laciniis lanceolatis obtusiusculis, staminibus alternis latioribus.

Allium striatum, Jacq. Icon. ii. t. 366. Coll. Suppl. 51. Bot. Mag. No. 1524. et No. 1035. Willd. Sp. Pl. ii. p. 77. Pers. Syn. i. p. 357. Poir. Encyc. Suppl. p. 268. Pursh. Fl. Sept. Amer. i. p. 222.
A. Canadense, Mich. Amer. Boreale, i. p. 194.
A. ornithogaloides, Walt. Carolina, p. 121.
Ornithogalum bivalve, Lin. Sp. Pl. ed. 1. p. 306.
Ornithogalum gramineum, Bot. Mag. No. 2419.
Ornithogalum Carolinianum, Hortulanorum.

Hab. in Canada, Carolina, &c. Floret Aprili et Maio.

Planta læte virens. *Bulbus* ovato-oblongus, albus, simplex. *Scapus* compressiusculus, 4 vel 5 uncialis, lævis. *Folia* disticha, linearia, obtusa, supra subcanaliculata, subtus convexa, paulo torta, scapo sæpe paulo longiora. *Spatha* bivalvis, pedicellis multo brevior. *Umbella* 4 vel 6 flora, interdum 10 flora. *Pedicelli* vix unciam longi. *Perianthium* ochroleucum: *laciniis* lanceolato-oblongis, obtusiusculis, interdum emarginatis, basi extus et intus viridibus (linea media rubescente). *Stamina* perianthio multo breviora. *Filamenta* ochroleuca, subulata, alterna latiora. *Antheræ* oblongæ, aurantiacæ; *polline* luteo. *Pistilla* stamina æquantia. *Stylus* teres, ochroleucus. *Capsula* obovata, obtuse trigona: *loculis* 1 vel 2 spermis.

OBS. The specimens of *Ornithogalum bivalve* which I have seen, have very long, slender, elongated peduncles, sometimes three inches in length, and the leaves more attenuated towards the apex than the living plants. Can this be a new species?—or is it the following?

SECT. 2.—Folia *acuta*.

138. *All. ornithogaloides*, scapo gracili, foliis linearibus attenuatis subcarinatis, spathâ mono- vel diphyllâ, umbellâ pauciflorâ laxâ, perianthii laciniis ellipticis obtusis.

Allium ornithogaloides, Poir. Encycl. Suppl. p. 265.

Hab. in America boreale. Floret Junio.

Bulbus ovatus, albus, simplex. *Scapus* nudus, teres, pedalis, gracilis. *Folia* linearia, apicem versus attenuata, acuta, subtus carinata scapum æquantia. *Spatha* diphylla, acuminata, interdum fere longitudine pedicellorum. *Pedicelli* filiformes a unciam ad biunciam longi. *Umbella* pauciflora, laxa. *Perianthium* album, magnitudine Allii striati: *laciniis* ellipticis, obtusis, linea media erubescenti carinatis. *Stamina* perianthii fere dimidio breviora. *Filamenta* subulata, alba. *Pistilla* longitudine staminum.

Obs. This is a very distinct plant from *Allium fragrans* and *striatum*, the leaves being attenuated towards the apex, and acute. This may, after some further investigation, prove to be the *Ornithogalum bivalve* of Linnæus, which is now referred to *All. striatum.*

139. *All. odoratissimum*, foliis lineari-subulatis, spathâ tri- vel quadriloba, umbellâ subfastigiatâ multiflorâ, perianthii laciniis ellipticis obtusis.

Allium odoratissimum, Desf. Fl. Atl. i. p. 289. t. 83. Poir. Encycl. Suppl. p. 267. Spreng. Sys. ii. p. 40.
A. Africanum, Dietr. ex Steudel Nomencl.
A. desertorum, Forsk. Flora Ægyptiaco-Arabica, p. 72.* Rauch Nomen. p. 74. ?

Hab. in arenis deserti prope Cassam et Tozzer. Desf. Desertis Kahirinis. Forsk.

Bulbus ovatus, tunicis externis fuscis, porosis, obductus. *Scapus* teres, glaber, pedalis et ultra. *Folia* Narcissi jonquili, subcarnosa, glabra, angustissime linearia, subulata, scapo multo breviora. *Spatha* tri- vel quadriloba; *lobis* ovatis, acutis, longitudine dimidii pedicellorum. *Pedicelli* fere unciam longi, tenues. *Umbella* subfastigiata, multiflora laxa. *Perianthium* album magnitudine Allii fragrantis: *laciniis* ellipticis, obtusis. *Stamina* perianthii fere dimidio breviora. *Filamenta* subulata, alba, basi dilatata. *Antheræ* oblongæ. *Pistilla* longitudine staminum. *Ovarium* trigonum, (album). *Stylus* brevis. *Stigma* subcapitatum.

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* "Foliis caulinis teretibus; antheris subulatis, umbella capsulifera. Corolla albo-rufescens; linea media obscuriori est e minoribus." Forsk. l. c.

Specierum Nomina sequentia tantum in Catalogis Hortorum, absque ulla Descriptione, inventa.

1. *Allium longicaule*, Horn. ex Fish. Cat. Hort. Petrop.
2. *A. atroviolaceum*, Horn. ex Fish. Cat. Hort. Petrop.; forsan A. fœtidum Willd.
3. *A. nitidulum*, Fish. Cat. Hort. Petrop.
4. *A. Dioscorides*, Sibth. Vide Fl. Græc.; forsan A. nigrum.
5. *A. napus*, Pall. ined. ex Steudel Nomencl.; forsan A. cepa var.
6. *A. lætum*, Pollini ex Steudel Nomencl.; forsan A. porrum var.
7. *A. decipiens*, Fish. Cat. Hort. Petrop.; forsan A. nigrum.
8. *A. undulatum*, Fish. ex Steudel Nomencl.; forsan A. Caspium.
9. *A. palustre*, Laj. Cat. Hort. Matr.; forsan A. Schænoprasum vel foliosum.

CORRIGENDA.

P. 76, last line, *read* campaniformes

82, at the end of line 5, *add* Bot. Reg. icon. At the end of line 16, *add*, This plant should have been placed in the preceding section, as well as *All. Græcum*, from the colour of their flowers.

84, line 5 from bottom, *read* rigidis *instead of* bifidis

86, line 6 from bottom, *read* virescenti-luteæ *instead of* virescentes, luteæ

88, line 6 from bottom, *read* profunde *instead of* prope

90, lines 10 and 34, *read* membranâ latâ

II.—*On the Saphan of the Hebrew Scriptures.*

By the Rev. DAVID SCOT, M. D.
Minister of Corstorphine.

(*Read 27th Januarg* 1827.)

THE Saphan is the name of an animal which occurs in four places of the Hebrew Scriptures, Levit. xi. 5, Deut. xiv. 7, Psalm civ. 18, and Prov. xxx. 26; but what animal is meant, is not agreed among interpreters.

In attempting to discover what kind of animal this is, I shall unavoidably be led into some philological details; but as such are necessary, in order to come to the result which I wish, I hope they will be excused.

The following are the marks which the Hebrew Scriptures give of this animal: "It chews the cud, but does not divide the hoof;"—"it is gregarious, and builds its house among the rocks; and in the choice of its dwelling evinces a wisdom which counterbalances its weakness."

The derivation of the word 'saphan' is not very obvious. It seems to refer to two verbs in the Hebrew tongue; one of which signifies 'to cover,' and the other 'to hide.' All the knowledge of the animal, then, which we can derive from its name, is, that it hides itself under a cover or roof,—a circumstance which is true of various animals.

In the four places of the Hebrew Scriptures in which it is mentioned, it is rendered 'coney' in the English Bible. Julius Bate, a Hebraist of some eminence, renders it 'a rabbit,' which we understand to be another name for the coney; and in almost all the modern Latin translations, it is called 'cuniculus,' which is a coney or rabbit.

In support of this rendering, almost all the later Rabbinical writers may be quoted, such as Baal Aruch, Isaac, Gersom, and David de Pomis; but notwithstanding such authority, it may be fairly doubted, whether the Saphan of the Hebrew Scriptures be the rabbit or coney.

That the rabbit "chews the cud," has been questioned by some; but that it does not "divide the hoof," that it does not "live in solitude," that it has "many enemies," and is "very defenceless," all have allowed; though we have never heard that it "excelled in wisdom," or "dwelt among the rocks."

Certainly the coney has some resemblance to the hare; and in two passages of the Hebrew Bible, in which the Saphan is mentioned, it is coupled with the hare; but if Varro and Pliny among the Latins, or Ælian and Galen among the Greeks, can be trusted, there is good reason for thinking, that the coney, formerly at least, was unknown to Egypt and Arabia, Palestine and Syria.

When rabbits or conies were first seen by the Phœnicians, who were an adventurous commercial people, they might believe them to be very like the Saphanim; and, therefore, when they first visited Spain, which, according to the voice of all antiquity, abounded with rabbits, they might call it Saphaniah, or land of the Saphanim; whence, there is a great probability, has arisen *Spania*, or *Hispania*, the name which this land has long borne in most languages of Europe.

But while we are in suspense whether the rabbit or coney be the Saphan of the Hebrew Bible, we need not go for further satisfaction to the Chaldee Paraphrase, Old Syriac Version, which is of great authority; nor to the Samaritan Pentateuch; as they only translate what we know not, by something still more unknown.

More precision may be expected from the Arabic interpreters, as the language of Arabia is better understood, and some of its writers have excelled in natural history, especially that branch of it which is called Zoology.

Unfortunately, however, those who have translated the Hebrew Scriptures into Arabic have been foreigners, or, if they have been natives, they have not sufficiently devoted themselves to the study of animals; but whether they have been natives or foreigners, they make the Saphan to be what they call the Fennec, or the Webro; for by both of these terms has it been rendered.

Fennec, as a verb, in Hebrew, Syriac, and Arabic, signifies 'to appear delicate,' or 'bring up delicately;' and the Fennec may have been so called, on account of the elegance of its form, or beautiful appearance.

Bochart, however, gives a different derivation. The animal in question, he says, has been called the Fennec Mouse, because it abounds among the Finni, whom, and the Gythones, Ptolemy, in his Geography, places under the Venedi, near the Vistula; and from whom, among the moderns, Finland has got its name.

It has also been called the Pontic Mouse, because found in Pontus, and other countries bordering on the Black Sea. Bruce says, it abounds in Barbary, Abyssinia, and the mountains and forests of Central Africa.

It is remarkable for its long ears and fine fur; and, while it is common to cold climates, it is no stranger to those that are warm. It dwells on trees, and not in rocks; and this character, were no other wanting, is sufficient to shew that it is not the Saphan of the Hebrew Bible.

Webro is the Arabic name of the other animal by which the Saphan has been rendered. This animal has been said by Jauharee, to be less than a cat, of a dusty or greyish colour, and to want the tail. Damir, however, says, that it has a tail, but very short, and that it is the animal which has got the name of Gannim beni Israel, 'the lamb of the children of Israel,' or, more shortly, Gannim Israel, 'Israel's lamb.'

We shall shew, by-and-by, that this is the animal meant by the Saphan; but we must first notice the opinions of Bochart, who is justly regarded as a giant in Arabic literature. He says, that the Webro has less claim to be considered as the Saphan, than the Fennec, to which our attention has just been given. He takes the Webro to be the Marmot, of which there are several species. The most common of these is the Marmota alpina. It is larger in the body than a cat, but shorter in the legs. It is gregarious, and discovers no small sagacity in the construction of its hole, in which it becomes torpid during the winter.

We agree with him in thinking that the Marmot cannot be the Saphan of the Hebrews, as it neither chews the cud, nor lodges in the rocks; and is neither found in Judæa, nor the neighbouring countries;—but dissent from him, when he says, that the Saphan is not the Webro, as some of the Arabic interpreters have thought it.

But before further attention to the Gannim Israel, which we take to be the true Saphan, we must set aside the claims of the Jerboa, which Bochart, in his Hierozoicon, has exhausted all his learning to prove to be that animal; and, in our judgment, the Gannim Israel alone has a better claim.

The Jerboa has never been used for the Saphan in any Arabic translation of the Hebrew Scriptures. Once, and once only, it has been thought a fit rendering of the Hebrew term for the common mouse.

The Jerboa, according to the best accounts, burrows in loamy earth, and sandy hillocks, especially under the roots of spartium, spurge-laurel, or other plants, because these hinder the loose earth or sand from falling about its ears, and filling up its hole.

This it constructs with uncommon art, supplying it with four entrances, as it is said, and these chiefly opposed to the four winds; which construction facilitates escape from danger, as well as contributes to convenience and comfort. Hence it seems to have got the name of Jerboa; or, as that word may be sounded Yerboa, from Rabia, in Hebrew and Arabic, 'to divide into four quarters,' or 'act in four ways.'

It has some resemblance to the hare, with which the Saphan is twice joined in the Hebrew Bible, as the fore-legs are much shorter than the hind-legs; and, in fleeing from danger, it jumps rather than runs; and hence it has got the name of the Mus jaculans.

This animal abounds in Egypt and the deserts of Lybia, in Arabia, Palestine and Syria, and must have been well known to the Hebrew historians and poets. It has all the characters of the Saphan, but one, and this we reckon decisive of its claims,—"it does not build its house in the rocks."

The claims of the Jerboa being set aside, we go on to observe, that Dr Shaw, in his Travels, makes the Gannim Israel, already noticed, the Saphan of the Hebrews. Probably this animal, whose claims we are now to consider, got this odd name, because great numbers of them are to be found on Horeb, Sinai, and other rocky mountains, near which Moses conducted the children of Israel, after he brought them out of Egypt.

It abounds also in the mountains of Palestine and Syria, particularly Bashan, Carmel, and Lebanon.

Bruce agrees with Dr Shaw in thinking this animal to be the Saphan, only he gives it the name of Ashkoko; Ashok, in the Amharic language, signifying ‘a prickle,’ and Ashkoko ‘the prickly animal,’ because the bristles along the back somewhat resemble the prickles of the hedgehog.

This circumstance deserves particular attention, as it will materially assist us in arriving at the meaning of that term, which the Greek interpreters, our safest guides in this case, employ as the proper rendering of the Saphan.

The Septuagint, Aquila, Theodotion, and Symmachus, uniformly translate the Saphan by the term Χοιρογρυλλιος; but none of the ancient Greek naturalists describe any animal, bearing that name. A Greek scholiast, however, on the “Peace,” a comedy of Aristophanes, lets us understand that the term was known to his countrymen. “There is an animal,” says he, “which is called by some Choirogryllios.”

Hesychius, who has left us a Greek dictionary, and Philoxenus, the author of a Greek glossary, explain Choirogryllios by ὁ ἐχίνος, ‘the hedgehog.’

From this explanation of Choirogryllios, some have thought that the Saphan was the hedgehog; but as the hedgehog does not chew the cud, go in troops, or live in rocks, no more need be said to shew that this is not the animal.

Clement of Alexandria, and he who wrote the Epistle of Barnabas, have thought the Saphan to be the hyena, in all probability from the hardness of the hair; but as the hyena is not weak,—though it repairs to caves and dens, —as it is solitary rather than social,—as, in prowling for its prey, it discovers fierceness and imprudence rather than cunning and artifice, it cannot be the animal of which we are in search.

On account of the difficulty of fixing on an animal, which has bristles like a hedgehog or a hyena, to which the term Choirogryllios can apply, we are indebted to another Greek scholiast, for this strange interpretation of the Choirogryllioi: "They are," says he, "a kind of fish, hares, or what are called gadflies."

While the Gannim Israel is bristly along the back, whence it has some resemblance to the hedgehog, or hyena, may it not also have the appearance of a large mouse? as we have already noticed that the Jerboa has. Let us try if we can trace it by that name among one or other of the Greek and Roman naturalists. HERODOTUS, in book fourth of his History, chapter one hundred and ninety-second, tells us, that, "in Egypt, some mice are two-footed," meaning the Jerboa; "some are Zegeries," as he calls them, or dwelling on mountains; "and some ἐχίνες," that is, with bristles like a hedgehog. With equal distinctness, ARISTOTLE, in the sixth book of his History of Animals, near the end, observes, "some mice, in Egypt, have hard hair, like land-urchins; and others walk on two feet, and have the fore feet short, and the hind feet long." PLINY, in book tenth, chapter sixty-fifth, of his Natural History, has confounded these two kinds of mice: "The Egyptian mice have hard hair, like hedgehogs; and walk on two feet, as the alpine mice."

But, further, may not the Ashkoko, if not the Jerboa, suggest to the ordinary observer the idea of a bear as well as a mouse? So JEROME, in his Letter to FRUTELA and JUNIA: "We must know that there is an animal, not larger than a hedgehog, resembling a bear and a mouse; whence, in Palestine, it is called Bear-mouse; and of this kind of creature there is great abundance in these parts; and they are always accustomed to dwell in caverns of the rocks, and caves of the earth."

Bochart says, that the Jerboa deserves the name of Bear-mouse, because it rears itself upon its hind legs, as the bear does, especially when grappling with its enemy. We think the Gannim Israel deserves this title, from the shape of its feet. These have something of that clumsiness, discernible in the feet of the bear; the fleshy or pulpy part extending as far as, or beyond, the claws or nails.

In this form of the feet lies its weakness. Being soft and tender, they are very unfit for digging, or fighting; providing a retreat in the ground, or defending itself when attacked.

To countervail this disadvantage, the Author of Nature has endowed it with that sagacity, which prompts it to choose a dwelling, the best calculated for its safety. Retiring to the crevices of the rock, or haunting the great stones which surround the mouths of caves, dug out of the rock; it can eat its food in quietness, and bring forth its young undisturbed.

It has every character which belongs to the Saphan of the Hebrew Scriptures; and as it is very abundant in Palestine, Syria, and all the adjoining countries, it is not likely that it would escape the attention of Moses, David, and Solomon, who were all accurate observers of nature, and eager to mark the wisdom of God, displayed in the peculiarities or habits of his creatures.

In the common works of zoology this animal is arranged under the class Mammalia, order Glires, and genus Hyrax. The suitableness of the term Hyrax, to characterize a genus including several species, cannot be questioned, if there are any species which it can include. Hyrax, among the Æolians, denoted a hog, and it has been used by NICANDER for a mouse. In defence of this application of the term, the scholiast remarks, that " mice were so called, because they resemble swine in the snout."

According to HARMAN, GMELIN, and SHREBER, there are three species in the genus Hyrax, viz. Capensis, Syriacus, and Hudsonius. CUVIER, however, thinks, that the Hyrax Syriacus is the same as the Capensis; and it can only be a rigorous examination of the two animals, which can induce us to believe, that the Hyrax of Lebanon differs from the Hyrax of the Cape.

The Hyrax Hudsonius is the tailless marmot of PENNANT, who says that it has four toes on the hind as well as the fore feet; but CUVIER doubts whether we have any account of this animal which can be depended on. Certainly we must carefully compare it with the Syriacus, before we can say that any difference has been established.

In the present state of our knowledge, then, we have no hesitation in agreeing with this illustrious naturalist, that there is but one species in the genus Hyrax, the Saphan of the Sacred Writings, the Webro of the Arabians, the Daman Israel of SHAW, the Ashkoko of BRUCE, and Clip-Dass of the Dutch.

The result, then, to which we have come, after the most unbiassed consideration, is, that the Saphan of the ancient Hebrews, rendered ' coney ' in the English Bible, is a very different animal; that it has a nearer resemblance to the hedgehog, the bear, the mouse, the jerboa, or the marmot, though it is not any of these animals.

While we have arrived at this conclusion, we can boast of no discovery. We only find that BOCHART, in his zeal for the Jerboa, has afforded the materials by which his own opinion is shaken or overthrown; and that BRUCE, who has made use of his materials, by a little more research, might have made out a much stronger and more decided case, in support of that animal, which we think he and Dr SHAW are right in judging to be the Saphan of the Hebrew Scriptures.*

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* See the article *Daman*, in the "Dictionnaire Classique d'Histoire Naturelle."

III.—*On the Structure of the Eye of the Sword-fish* (Xiphias gladius, *Lin.*)

By Robert Edmond Grant, M. D., F. R. S. E.,
F. L. S., M. W. S., &c.
Member of the Medico-Chirurgical Society of Edinburgh, Fellow of the Royal College of Physicians of Edinburgh, &c.

(*Read* 27*th January* 1827.)

FROM the great density and obscurity of the medium through which fishes receive the rays of light, compared with those of the atmosphere, their organs of vision necessarily present considerable differences in form and structure, from those of land animals. Predatious fishes, which frequent great depths, have very large eyes, from the general darkness of the ocean, and probably from the diminished energy of the nervous system in animals so low in the scale. The eyes of the common swordfish, here described, were four times as large as those of an ox, although the bulk of the fish did not equal one half of the bulk of that quadruped. Blainville has observed, that fishes which inhabit the open sea have the eyes larger and better developed than those which frequent the shore. As the refractile power of the aqueous humour of the eye is the same as that of water in which fishes constantly reside, this humour is unnecessary, and nearly absent, in that class of animals, and consequently their cornea is flat. This flatness of the cornea, however, could not be preserved, if the eyes of fishes were formed of soft membranes, like the eyes of quadrupeds, as the lens would then be pressed forward by the muscles surrounding the eyeball against the iris, and completely prevent the pupil from changing its dimensions. Hence we find a firm cartilaginous or osseous framework in the eyes of fishes, to preserve the flatness of the cornea, analogous to what is employed in birds to preserve a great convexity of that part. The great thickness of the sclerotic coat, the presence of the choroid gland and adipose matter between the sclerotic and choroid coats behind, and the flatness of the cornea before, shorten very much the axis of the eye in fishes. Hence a complete spherical form, and greater hardness of the crystalline lens, is necessary in these animals, to bring the rays of light more quickly to a focus. Two small portions of a sphere would have been sufficient, if the texture of the lens were homogeneous like glass; but this organ possesses a highly complicated structure, consisting of fibrous layers, beautifully disposed to check the aberration of light, and increasing in density from the surface to the centre. The distance between the cornea and the retina in the swordfish is about one inch and a half, while the transverse diameter of the eye is three inches. The shortness of the axis, and the enormous size and spherical form of the lens in the eyes of fishes, reduce greatly the proportion of their vitreous humour. In the common herring, the axis of the vitreous humour is only a fifth part of that of the lens; whereas in man, it is nearly four times greater than the axis of the lens. In the large eye of the swordfish, the axis of the vitreous humour is not one-half of that of the lens. The ciliary processes and foramen centrale are not found in fishes. The choroid gland, the solid sclerotic coat, the fatty matter within it, and many other peculiarities in the structure of the eye, belong exclusively to this class of animals; and besides many general peculiarities, the eye presents in the individual species all the variety and irregularity which characterize the organs of animals low in the scale, and exhibits a gradual transition to the apparently anomalous eyes of molluscous animals. The broad flat irregular form of the eye, and the quantity of matter interposed between the outer coat and the retina, in the swordfish, closely resemble the appearances presented in the eyes of the Octopus and Loligo. From the great size and simple structure of this organ in fishes, a minute examination of these peculiarities might throw much light on the nature of many parts, the uses of which are still perfectly unknown in the higher orders of animals. The eye of the common swordfish appears not to have been hitherto examined; and I am indebted for the opportunity of making the following observations to Professor JAMESON, who kindly presented me with the two recent eyes, and the whole of the viscera, of the beautiful male specimen of that rare animal, lately taken in the Frith of Forth, and now preserved in the Museum of the University.

The eyes of the swordfish are so perfectly lateral in their position, and so flat anteriorly, that that animal can perceive objects only with one eye at a time. This is probably another reason, besides those stated above, for the eyes of this fish being usually large. In the specimens I examined, the transverse diameter measured 3 inches, the axis $2\frac{1}{4}$ inches, and the entire animal 7 feet 2 inches from the point of the sword to a line drawn between the tips of the tail. The general form of the eye is that of an irregular hemisphere, a little depressed in the direction of the axis, the anterior part corresponding to the flat base of the hemisphere. The eye is circular round the axis, but its sphericity on the back part is very imperfect from the irregular form of the osseous plate of the sclerotic coat. The sphericity of the retina within is not interrupted by this irregular form of the external coat, as there are several soft parts interposed between them. The conjunctiva is black, like the skin of the animal, to the margin of the transparent cornea. The pupil is irregularly circular, as in many other fishes. The iris has a greenish-white colour, and a beautiful metallic lustre. The cornea is flat, and about $1\frac{3}{4}$ inch in diameter. The anterior edge of the osseous plate projects beyond the margin of the cornea, so as to make the anterior part of the eye a little concave externally. There is no eyelid, but a looseness of the conjunctiva round the edge of the orbit, to admit of the motions of the eye. The conjunctiva does not pass loosely over the cornea, as in the haddock and many other fishes, but adheres so strongly as only to be separated from it with difficulty, after long maceration. The muscles of the eyeball are very strong and red coloured, like those of a quadruped, and correspond with the extensive distribution of the red globules of the blood through the other parts * of this animal. The adipose substance, in which the eye is imbedded, is very different from the soft white watery substance we usually find in this situation in smaller fishes. It is firm, of a yellowish-white colour, and filled with an oily matter, which agrees much in its smell, colour, and other properties, with the oil procured from the whale.

The tunica conjunctiva can be separated with ease from the surface of the sclerotic as far as the margin of the cornea, where it is firmly connected with the projecting edge of the osseous plate. After long maceration, it can be torn

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* See my account of the anatomy of the thoracic and abdominal viscera of the Swordfish, in the Transactions of the Medico-Chirurgical Society of Edinburgh, vol. iii.

from the whole surface of the cornea, with which it appears to be connected by cellular substance. But, by the same treatment, the cornea can as easily be separated into many layers, as into the two formed by tearing off the conjunctiva. The cornea is very thin, compact, and of equal thickness throughout; it is lodged in a small groove of the osseous plate; but, at the nasal side of the eye, it passes a little over the inclined margin of that plate. The outer layer of the sclerotic coat consists of strong white shining tendinous fibres, forming a compact membrane, which adheres firmly to the whole outer surface of the osseous plate. The fibres of the outer covering of the optic nerve, which is considered to be a continuation of the dura mater, are very distinctly seen to mix and disappear among the fibres of the sclerotic, so as to form with it a continuous membrane. This layer of the sclerotic is connected, like the conjunctiva, to the outer margin of the cornea. The osseous plate of the sclerotic covers the whole of the eyeball, excepting the aperture on the fore part covered by the cornea, and a space nearly of the same size on the back part of the eye. The irregular round opening on the fore part of the plate is 1¾ inch in diameter, with an inflected margin 3 lines in thickness. The plate is hard, translucent, somewhat brittle, of a yellowish-white colour, and strongly marked fibrous texture. It is thinnest and most pellucid where its diameter is greatest, and it terminates posteriorly by a thin and very uneven margin. It does not effervesce in nitric acid, like substances containing carbonate of lime, and appears to be of a condensed horny texture, containing a quantity of oily matter between its fibres. It is divided into two equal parts, an upper and a lower, by an uneven suture, passing from before backward, or in the direction of the axis. The tendinous extremities of the straight and oblique muscles of the eye pass through the outer layer of the sclerotic, and are firmly inserted into the osseous plate. On the upper half of the plate, about half an inch from its ragged posterior margin, there is a perforation about two lines in diameter, for the passage of the arteries and veins of the eyeball. On the inside of this perforation there is a bony ridge, about a line in thickness, for the protection of the vessels passing through it. This hard inner layer of the sclerotic is continued in a membranous form, and in firm union with the outer layer, from the ragged posterior margin, to the optic nerve. The broad anterior inflected margin of the plate affords attachment to the iris and the cornea, and gives lodgment to a white adipose thick band surrounding the eye, and placed anteriorly to the ciliary ligament. Immediately within the osseous plate we observe a very delicate black coloured membrane, adhering loosely to it as far as the ciliary ligament, where it becomes inseparably united with the vascular layer of the choroid. This thin membrane lies immediately over and in contact with the fatty substance enveloping the choroid gland, and occupies the situation of the white silvery pigment which forms the outer layer of the choroid coat in many osseous fishes. Near the ciliary ligament this black membrane acquires a light grey colour and metallic lustre; but at the ciliary ligament, where it unites inseparably with the vascular layer of the choroid for a line and a half, it again becomes dull, and has a deep purple colour. On the fore part of the ciliary ligament it resumes its metallic lustre, becomes detached from the choroid, and can be traced with ease dipping into an angular recess between the uvea and the iris, and again mounting to descend over the fore part of the iris. In this animal there is a wide angular space, a line in breadth, between the uvea and iris, which contains a white cellular substance. The iris is thick and firm, like cartilage, and, on removing its metallic pigment from the fore part, it presents a black surface. The white adipose band surrounding the eye before the ciliary ligament, rests on a peculiar thin membrane, which separates it from the outer dark layer of the choroid, and extends forward as far as the cornea. The dark coloured external layer of the choroid, in the Xiphias, somewhat resembles the thin black lining of the sclerotic of quadrupeds, which was thought to be a continuation of the pia mater. There is no silvery pigment in this animal covering the choroid gland, which we find so abundant in many osseous fishes, as the cod and haddock.

Between the thin dark outer layer of the choroid and its thick vascular layer, there is an immense deposit, of a white semifluid fatty substance, half an inch in thickness, on the back part of the eye, and extending as far forward as the ciliary ligament. The fatty deposit is thickest on the back part, near the optic nerve, and becomes gradually thinner towards its anterior termination; it is traversed in every part by numerous large branches from the ocular artery, and by the ciliary veins returning to the choroid gland. These vessels are filled with red blood, and are so numerous as to give a red tinge to the oily substance through which they are ramified. The great bed of fat completely envelopes that singular organ the choroid gland; it enables the great trunks of the ciliary arteries to subdivide, before penetrating the choroid, to form its innermost layer; and it enables the internal parts of the eye to assume a sphericity which the osseous plate of the sclerotic is far from possessing. The choroid gland has the same deep blood-red colour, firm consistence, and vascular texture, as in other fishes; it is composed of two parts surrounding the optic nerve, the one shaped like a horse-shoe, and the other nearly straight. These two pieces are flat, about half an inch broad, and nearly a quarter of an inch thick. The venous sinus, described by Blainville (*Anat. Comp.* t. i. p. 425) as occurring in the inner part of this singular fleshy mass, is large and distinct in the Swordfish, where it appears like the pelvis of a kidney, with numerous openings, probably of the ciliary veins, terminating in it. Blainville considers the choroid gland of fishes as a vascular ganglion, or sinus, for the reception of the ciliary veins. I may observe, that, on cutting open this body, in the Swordfish, we find its outer part composed of a compact parenchymatous texture, and, as we approach its inner sinus or pelvis, it consists of distinct straight parallel fibres, which may possibly be ducts or vessels, leading to the central cavity. After remaining long in spirits, the inner concave margin of the organ splits spontaneously, and always in the direction of these parallel fibres. The vascular membrane of the choroid, which lies immediately beneath the bed of fat, is distinctly separable, in the Swordfish, into two layers. The outer, or venous layer, has a bluish-grey colour, and a strongly marked corded or striated appearance, produced by the straight veins which compose it. The inner, or arterial layer, termed the Tunica Ruyshiana, and composed of the ramifications of the ciliary arteries, has a deep brownish-purple colour on the surface where the pigment rested. At the place of the ciliary ligament, this inner layer of the choroid assumes a yellowish-white colour, and continues of this light colour over the whole of the uvea to its free margin, where it unites at an acute angle with the iris. This white part of the choroid, and the white surface of the uvea, are covered, in the natural state, like every other part of the choroid, with a thick layer of a brownish-black pigment. There are no ciliary processes projecting in towards the margin of the lens, but in their place we find the choroid distended by the white adipose band I have already mentioned as surrounding the fore part of the eye, on the outside of the choroid, and near the margin of the uvea. Blainville thinks he has observed ciliary processes in the eye of the *Squalus maximus.* At the place where the optic nerve penetrates the inner layers of the choroid, it has a very contracted and strangled appearance; and the retina which it forms, is proportionally the most bulky I have yet met with in any animal. The retina forms a thick pulpy coat, of a bluish-white colour, and becomes more thick and opaque as it advances towards the uvea, near the base of which it terminates by a smooth and even margin. We observe a straight white line or fissure extending, on the nasal side of the eye, in this animal, from the entrance of the optic nerve to the base of the uvea, along the inside of the choroid coat. Along the whole of this line the retina is firmly bound to the choroid coat, and it has no connection with the choroid at any other part. This remarkable appearance has the closest resemblance to the long fissure of the choroid through which the retina enters in the class of birds, but is very rarely met with in fishes. The eyes of the cod, the haddock, and many other osseous fishes, present no appearance of this kind, but have the retina quite free round the optic nerve. The retina appears to form a larger mass than could result from the mere expanded filaments of the contracted part of the optic nerve. The pulpy external layer of the retina is so thick in the Swordfish, particularly near its anterior termination, that it can be torn with the forceps, like cellular substance, into several layers. The white membrane or ligament, corresponding to the pecten of birds, already discovered by Blainville, in six different genera of fishes, is strong and distinct in the Swordfish, proceeding from the anterior end of the fissure of the choroid, through which the retina enters, to the capsule of the lens. Although the lens is a solid sphere, an inch in diameter, the pecten is so firmly attached to its capsule, as to bear its weight with ease when suspended out of the water. On the opposite side of the lens there is a smaller ligament of the same kind. The great body of the lens, inclosed in a capsule of almost tendinous consistence, after remaining some weeks in spirits, splits spontaneously into concentric lamellæ, and deep rents in the direction of its axis, and separates easily into coarse fibres having for the most part the same direction.

IV.—*Notice regarding a Vein of Asphaltum, or Slaggy Mineral Pitch, found imbedded in Gneiss, in the Hill of Castle Leod, near Dingwall, in Ross-shire.*

By HENRY WITHAM, Esq. of Lartington,
F. R. S. E. & M. W. S.

Read 5th February 1825.

Being desirous to visit the justly celebrated primitive mountains of the mid-land and northern divisions of Scotland, my son and I, accompanied by Mr Somerville, lapidary, left Edinburgh on the 6th August 1824. We very soon found ourselves in the midst of the Grampians. It is here the traveller is struck with the peculiar character and display of the features of these primitive formations. Their wildness and sublimity, their conical peaks, the abrupt and rugged fronts of their escarpments, alternately advancing and retreating from the eye in every possible variety of form, present a scene so rude and original, that it at once stamps the memory with a lasting impression of the Divine Omnipotence. Having crossed and recrossed these pathless wastes in almost every direction, for the space of nearly a month, we arrived at Inverness.

We were here advised by some of our friends to visit several interesting situations in Ross-shire. This is a rich and beautiful part of Scotland, abounding on the east with rich, early, and highly cultivated land.

After having crossed the Murray Frith, the first stratum we observed was a conglomerate. This stupendous rock is peculiarly conspicuous at Brahn, two miles to the south-west of Dingwall. Upon this rock rests the old red sandstone, which continues the whole way along the eastern district. Near to Dingwall are the famed Wells of Strathpeffer, the water of which is similar in taste and smell to that of Harrowgate, but stated to be 25 per cent. stronger. We here obtained specimens of the rock from which this water springs. It is a highly sulphuretted limestone, the first Secondary of WERNER, and the Mountain Limestone of English geologists.

Adjoining to these strata, I was informed by Major Mackenzie (to whose politeness I am much indebted), that, in the Hill of Castle Leod, we might see a seam of what was generally supposed to be Glance-coal. It is now many years since this vein has been worked, so that we found much difficulty in obtaining a specimen by which we could form any judgment of its component parts. As, however, the nature of the strata of this part of Scotland rendered it improbable that coal of any description should be found here, on my return to Edinburgh, I wrote to Major Mackenzie, and requested him to employ some workmen to open out the almost lost vein. I am happy to say they succeeded; and I have now the honour of presenting, for the inspection of the Society, some of the specimens. Upon a thorough examination, and after various experiments, what has always been supposed to be Glance-coal (Anthracite compacte of Haüy), proves to be

Asphaltum, *Bitume solide* of Haüy, the *Slaggy mineral pitch* of Jameson.

Its external characters, according to Professor Jameson, are: Colour black; occurs massive, disseminated, sometimes globular, reniform, and stalagmitic: externally and internally, resplendent and shining; lustre resinous; fracture conchoidal, soft, opaque, sectile. It occurs in veins, and in reniform and imbedded masses, in secondary limestone in Fifeshire, in clay ironstone in East Lothian, in veins at Houghmond Hill in Shropshire, and in mineral veins in Cornwall. According to Phillips, it varies from brownish-black to black; it occurs massive, with a conchoidal fracture, and shining resinous lustre, and it is opaque and very brittle; specific gravity 1 to 1.6. By combustion, it leaves a small quantity of ashes. It consists chiefly of bituminous oil, hydrogen gas, and charcoal; the last is in much greater proportion than in elastic bitumen. Oxide of iron, and two or three of the earths, sometimes constitute very small proportions of it. It is found in the Palatinate, in France, in Switzerland, in large strata in Albania, and in large pieces on the shores and floating on the surface of the Dead Sea. It abounds in Trinidad and Barbadoes. In the former, it occurs in a vast lake three miles in circumference, called the Pitch Lake; the thickness of which is yet unknown.

Thus, Gentlemen, it appears, that, before this discovery, we were not aware of the presence of Asphaltum in any of the Primitive rocks of Scotland; and, with the exception of the Carharack Vein in Cornwall, where it is found accompanying yellow copper, we were not aware of its occurrence in any of the primitive rocks of Great Britain. This Scottish vein is found in gneiss, in the Hill of Castle Leod; it runs nearly perpendicular from the horizon, and is not above 1½ or 2 inches in thickness.

I have thus endeavoured, at the request of our President, to lay before you a plain statement of the geognostic and geographic situation of this mineral. From this and other observations I have made in our short geological tour, I am induced to believe, that much might be done, by perseverance and research, in promoting many useful discoveries; and I more than ever feel convinced, that the great volume of Nature should be long and anxiously studied and consulted, by those who are desirous to promote science, and forward the high intentions of this Society.

V.—*Description of a New Species of Ornithorynchus.*

By Mr William Macgillivray, M. W. S.

(*Read 22d January* 1825.)

THE labours of the anatomist, important as they are, and high as is the rank which they occupy in the scale of science, are, in many cases, lost to the scrupulous and intelligent naturalist, from the circumstance that the animals to which they refer have not been described with sufficient precision, to enable him to determine with certainty the species to which they belong. This has been particularly the case with the Ornithorynchus: from the vagueness of the notices given with respect to the more obvious, though not less characteristic, and not less natural, features, of the species or varieties of this genus dissected by anatomists, we can only be certain that they have described *some* particular species or variety. The fact appears to be, that anatomists, like other people, have pretty frequently a notion that nothing is, or can be, so very important as their own pursuits; they forget that the general form, the covering, the claws, the mouth, nostrils and ears,—in short, whatever of the animal is external and obvious, are just as much a part of its constitution, as the intestines, muscles, blood-vessels, or whatever of it is most internal and recondite; and that, in fact, without a precise knowledge of the former, there can be no certainty with regard to the latter. Considered as scientific knowledge, the possession of mere external characters, without any thing else, is as despicable as that of mere anatomical characters, without any thing regarding external appearance, manners, habits, haunts, and uses. To produce any thing like perfect delineations of natural objects, it is necessary to attend to *all* the circumstances of organization; and although anatomy is useful, as tending to this end, external characters are not less so; nor can the mode of life, which results from the conformation, be considered as an unessential part of the history of animals. Where anatomy and natural history have gone hand in hand, they have produced such men as Cuvier, Blumenbach, Lamarck, Blainville,—who, it may be said, are great anatomists, because great naturalists, and great naturalists, because great anatomists. But leaving to those who may have dissected Ornithorynchi, to inform us what species or varieties they have operated upon, I proceed to describe a new species, larger and somewhat more remarkable than that hitherto known.

ORNITHORYNCHUS CRISPUS, *Greater Duck-bill.*

SPECIFIC CHARACTER.—Ornithorynchus pilis universis magis minusve apice curvatis, caudalibus superioribus geniculatim reflexis, implexis.

DESCRIPTION. Beak very broad, complanate, dilatato-rotundate at the end. Nostrils small, round, subterminal, approximate, with an inner membranous rim. Claws of fore-feet straight, slightly recurvate, long, subdepressed, rounded at the end; membrane longer than the claws by half an inch; claws of hind-feet terminal, compressed, sharpish, acute at the edges, obliquely curved, the outer outwards, the rest inwards. The spur curved, conical, strong, bluntish, with the orifice almost terminal, and on the convex side of the curve. Tail broadly spatulate.

Hair consisting of two kinds, the one very soft, fine and thick, and of moderate length; the other, which forms the surface of the pile, longer, and in quality as follows. On the upper part of the head, very fine until at the extremity, where it is much enlarged and flattened, so as to present a surface of stiffish, compact, hard pile; longer around the margin of the beak, and but slightly enlarged at the end. Along the back it is very fine, excepting at the end, where it is enlarged and flattened, and acuminate, the tip curved backwards; on the sides longer, the flattened part elongated, acuminate and more curved, so as to feel rough. The middle of the throat, and two longitudinal bands on the breast and belly, without any of this second sort of hair. On the legs and feet it is very short, entirely flattened and blunted, and compressed. On the upper part of the tail, the fine hairs are very short, curled and ravelled; the others longish, enlarged from the commencement, bent about the middle at an open angle, and blended and matted together in all directions, being very stiff and harsh to the feel. Under surface of tail rubbed bare, excepting at the margin, where the hairs are flat and stiff, and worn short.

Beaks and webs dark-brown, claws paler. The fine hair is greyish-blue on the upper parts, bluish-grey tinged with yellow on the lower, excepting from the root of the tail to the middle of the breast, where it is pale-chesnut. Excepting on the belly, the colours of the fur are those of the thick hairs, and are as follow: upper parts in general dark greenish-brown; upper part of the head tinged with yellow; a yellowish-white spot before each eye; sides and tail lighter, being of a yellowish-grey. Under part of each of the limbs, and perineal region, of a vinous colour, approaching to chesnut.

The dimensions are as follow:

Beak from the frontal margin to the end, -	2½ inches.
Breadth of the beak near the end, - -	1⅝
Height of frontal margin, - - -	5½
Length of the spur, - - - -	5½
Total length, - - - - -	23

The above description is from a specimen in the Museum of the University of Edinburgh, presented by Alexander Hunter, Esq. writer to the Signet, and is said to be from Van Diemen's Land.

A specimen in the same extensive and interesting collection, also from Van Diemen's Land, and presented by Dr Burnet, one of the Medical Commissioners of the Navy, is of the following description. Its length is 21 inches, and it is proportionally smaller in all its parts. It agrees with the above in all essential particulars, the colours, however, somewhat paler; the hairs of the tail are equally matted, but longer; the under surface of the tail is entirely covered with very short, flat, adpressed hairs; the spurs much more slender, acute, and of a pale horn-colour; the vinous or chesnut-coloured spots of the under parts more distinct. This individual is probably a younger one, as is indicated by the comparative fineness of the pile, the slender spur, and inferior size; and had newly received its pile, as is shewn by the under surface of the tail being covered, that part having been rubbed bare by use in the former specimen.

Another individual in the Museum, although not more than 16.5 inches long, I am inclined to consider as of the same species, because it agrees with the others in all essential respects. The hairs present the same forms, and the colours equally correspond. The hair of the tail is less matted, but it is still distinctly geniculate. This individual is a female, as is indicated by the absence of spurs; and its juvenility is pointed out by the usual characters.

There is another interesting specimen in the Museum, which was presented by Sir James Macgrigor. The length of this individual is 25 inches, but, being apparently somewhat elongated in the course of stuffing, it may be stated at 24. The characters are in general as in the one first described, but the colours differ a little. The general tint of the upper parts is deeper, that of the under parts light-grey, the tips of the longer hairs being whitish, the under neck and spot before the eye greyish-white. The under surface of the tail is nearly bare. The dimensions of this individual are as follow:

Beak from the frontal margin to the end, -	$2\frac{1}{2}$ inches.
Breadth near the end, - - - -	$1\frac{3}{4}$
Height of frontal margin, - - - -	$0\frac{1}{2}$
Length of tail, - - - - - -	$5\frac{1}{2}$
Length of spur, - - - - -	
Total length, - - - - - -	25

In this individual, the hairs, and especially those of the under surface, are more decidedly curved than even in that first described, and the feel of the pile is in consequence more rough. It may probably be a very old individual.

It will be seen, on comparing this description with those of the species hitherto known, that it differs specifically from all of them. It were needless to institute comparisons here, as any one who may feel interested in the subject can easily make them for himself. I shall only observe, that the ordinary length of the usually described species is about 14 or 15 inches, and that the Ornithorynchus *fuscus* of Desmarest and Cuvier is probably a young animal of the present; while there is another Ornithorynchus with smooth hair, of the same size as their *fuscus*, and of nearly the same colour as the O. *crispus*, which, together with his *rufus*, I consider as forming only one species, the individuals of which vary in colour, and which I would designate by the name of Ornithorynchus *lævis*, and characterize as follows:—Ornithorynchus pilis universis rectis, caudalibus superioribus elongatis liberis.

Edinburgh,
17*th August* 1824.

Since the above paper was read to the Society, I have found reason to think, that the large individuals described in it are old, or, at least, adult specimens; and that all the other alleged species, characterized by a difference of colour in the hair, or other circumstances, are merely varieties dependent upon differences of age, sex, or locality. If this opinion be correct, the *Ornithorynchus paradoxus* of Blumenbach is here described, for the first time, in its perfect state.

18*th September* 1827.
Edinburgh.

VI.—*Observations on the Anatomy of the Paca of Brazil,* (Cœlogenus, F. Cuv.)

By Robert Edmond Grant, M.D., F.R.S.E., F.L.S., M.W.S., &c.

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THE specimen of the Paca from which I have taken the following observations, was a full-grown male, measuring 2 feet 7 inches along the back, from the point of the nose to the anus, and having a circumference of 21 inches round the belly, and 17 inches round the chest immediately behind the fore-legs. It was purchased from an American vessel at Liverpool, and, after two years' confinement in a travelling menagerie, it died of tubercular disease, which affected almost every organ of the thorax and abdomen. The skin of the animal being perfectly entire, and presenting a fine view of the characters of the adult Paca, forms an interesting preparation in the Museum of the University. The carcase was presented to me for dissection by Professor Jameson. This animal is an inhabitant of the moist and sultry plains of South America, and has never been met with in any other part of the globe. It abounds in Brazil, Guiana, and Paraguay, where it lives and breeds, like a rabbit, in burrows on the banks of rivers. It generally produces one at a birth; it lives on vegetable food; it is easily domesticated, and its flesh forms an esteemed article of food in the countries it inhabits. This animal has been known to European naturalists under the Brazilian name of Paca for more than 200 years, being described by Lery in 1578. It was described and figured by Marcgrave under the same name in 1648; and Ray, Buffon, Cuvier, and other naturalists, have described it under the same title. Fred. Cuvier has called it Cœlogenus (hollow cheek), from the deep groove under the broad zygomatic arch on each side of the head. The Paca is one of the largest known Rodentia, or Glires, and is distinguished from the other genera of that order, by having five toes on each of the fore and hind feet, and by the deep hollow in each cheek. Daubenton has minutely described the anatomy, and figured the internal organs, of many animals of this order from the New World, nearly allied to the Paca, as the Agouti, the Guinea-pig, &c.; but he has not figured any of the soft parts of the Paca,—and the few observations he has given on its anatomy, being taken from a very young specimen not larger than a rat, are sometimes inaccurate, and are quite inapplicable to the adult animal. He states that only one branch came off from the arch of the aorta, whereas in the adult animal I have found two distinct branches, as in most other quadrupeds. He found the cæcum not 2½ inches long, whereas in the adult it is nearly 19 inches in length. The whole intestinal canal he found to be 7 feet in length, whereas in the adult it measures upwards of 30 feet. Cuvier has enlarged Daubenton's measurements of the intestinal canal, but neither he nor any succeeding anatomist appears to have added to our knowledge of the internal structure of this animal. As the very young specimen dissected by Daubenton was a female, the male Paca, to which the following observations relate, does not appear to have been hitherto dissected.

Daubenton states, that the Paca possesses clavicles, and, in his figure of the skeleton, he has represented them as complete, and uniting with the acromion of the scapula. If, however, the clavicles had been complete in this animal, it would have formed an exception to the group of American *Glires*, to which it belongs, as they are incomplete in the Agonti, the Guinea-pig, and the Capibara. Cuvier has placed the Paca among the Rodentia that possess imperfect clavicles, as he has done the Capibara, which he states in his *Leç. d'An. Comp.* (i. 245) to have no clavicle whatever. Later writers have followed his example in giving imperfect clavicles to the whole group. In the Paca the clavicle consists of a small cylindrical bone, about a line in diameter, 1¼ inch in length, considerably enlarged at each end, and which does not reach either the sternum or the scapula. A cylindrical compressed cartilage, three-fourths of an inch long, is attached to the sternal extremity of the clavicle, and plays loosely on the inner surface of the sternum in a wide capsule. There is no articular surface at the upper part of the sternum for the attachment of the clavicle. The scapular extremity of the clavicle has a soft irregular piece of cartilage only two lines long attached to it, which is only connected by cellular substance with the muscles of the neck, and the acromion of the scapula has no articular surface. The muscles of this animal had a pale and wasted appearance, and there was scarcely any adipose substance either on the external or internal parts of the body, which may have been owing to the lingering consumption of which it died. Numerous tubercles existed in the substance of the pleura costalis at the sides of the vertebræ; they were spread over the surface and through the whole texture of the lungs to such an extent, as to cause large parts of these organs to sink when immersed in water; they abounded on the pericardium, on the large arterial trunks, on both sides of the diaphragm, on the coats of the intestinal canal, on the surface and through the whole substance of the liver; the pancreas and the spleen were masses of tubercles; they were spread over the peritoneum, they extended through the substance of the kidneys to the parietes of the pelves; and the bronchial and mesenteric glands were very much enlarged and hardened, exhibiting the same firm cheesy consistence as the whole of the tubercles. No hydatids were found in any of these organs; but I have found on the omentum of the domestic rabbit large specimens of the *hydatis pisiformis* Lam., while the liver of the same animal was entirely traversed with small, hard tubercles.

The cartilaginous rings surrounding the trachea, and its principal branches in the Paca, cover four-fifths of the circumference of these tubes, as in the Guinea-pig. The lungs are divided into three lobes on each side of the chest, and the heart lies in a longitudinal position on the mesial line. Each lung was similarly divided, by two transverse fissures, into three lobes; the smallest of which tapered upwards to the imperfect clavicle, the lowest was considerably the largest, and the middle lobe was bounded, above and below, by two flat and parallel surfaces. A very small additional lobe, about an inch in length, and much divided, was placed at the lower and back part of the right lung, making four lobes on the right side, as in most other quadrupeds. The heart was comparatively small, soft, and pale coloured. The right cavities were more thin and flaccid than is commonly observed; there was no opening at the place of the foramen ovale; the opening and sinus of the coronary veins were unusually wide, and terminated on the right side of the right auricle, immediately above the entrance of the inferior cava. From the longitudinal position of the heart in the middle of the thorax, with its apex directed to the centre of the diaphragm, the inferior cava passed upwards about 3 inches, after perforating the diaphragm, before it reached the right auricle. The muscular fasciculi in the right auricle were disposed in regular arborescent forms. The tricuspid, mitral and semilunar valves, presented nothing peculiar; but the fleshy columns of the right ventricle were more than usually prominent and numerous. All the cavities of the heart were distended with firm coagula of blood, but no tubercle appeared on any part of the organ. The heart had a compressed, ovate form, measuring 1¾ inches in its greatest breadth, and 2¼ inches from the base to the apex. Two branches were given off from the arch of the aorta, as in other quadrupeds. The pericardium was thicker and stronger than we generally find it in Rodentia. The phrenic nerves, and the nerves generally, of this animal were large and distinct. The Paca is stated by Lacepede to possess a remarkable sensibility, and its surface is covered only with a loose bristly hair, like that of a hog.

The great length of the intestinal canal, and the size of the stomach and cœcum, point out more distinctly than the chisel-shaped fore teeth, the kind of food on which this animal naturally subsists. The specimen I examined was fed, during its confinement, on potatoes boiled or unboiled, loaf-bread, apples, cabbage, or almost any kind of vegetables. In their natural state, these animals live on herbs, or shrubs, or dig up from the ground with their very long claws succulent roots, as we observe done by the common hog. The Paca resembles the hog in the great size of the back part of the abdomen, and in the grunting sound it frequently produces. The œsophagus entered near the middle of the upper margin of the stomach, leaving a portion on the left side like a cæcum, 3 inches in length. The cardia was thick and muscular, the stomach smooth internally, and with thin parietes, and the pyloric extremity was suddenly contracted by a narrow ring at its entrance into the very wide commencement of the duodenum. The stomach lay chiefly on the left side, and tapered regularly from the left to the right extremity; when moderately inflated, it measured 8 inches in a straight line from left to right. The small intestines, from the pylorus to the cæcum coli, measured 21 feet; the cæcum coli measured 19 inches in length; and the large intestines, from the cæcum to the anus, were 11 feet long. The commencement of the duodenum was so much dilated, as to form a small cæcum an inch long above the pyloric orifice, the dilated part of the duodenum continued about 4 inches from the pylorus. The rest of the small intestine had a uniform appearance, and was about an inch in diameter. The ilium terminated by a valvular orifice, in a wide and convoluted cæcum, 2½ inches in diameter, deeply divided by internal transverse plicæ, marked externally by longitudinal bands, and extending from the left to the right iliac region. The cæcum formed two complete spiral turns, and tapered regularly to its shut extremity. The passage leading from the cæcum into the colon was placed near that of the ilium, at the wide commencement of the cæcum. The first ten inches of the colon were nearly as wide as the cæcum, and turned between its convolutions. This dilated part of the colon exhibited a corded appearance, produced by numerous small longitudinal plicæ of the inner membrane. The whole remainder of the colon and the rectum had the same diameter and general appearance as the small intestines. Immediately on escaping from the spiral turns of the cæcum, the colon doubled itself, and formed a small circular disk of convolutions lying in the same plane, and connected together by mesocolon. The colon, more than ten feet long, had no external longitudinal bands, nor the slightest puckering of its coats.

The liver was divided, by distinct fissures, into six lobes, increasing progressively in size from the right to the left side, and rather more than half of the organ lay on the left of the mesial plane. The gall-bladder lay between the two central lobes, firmly attached to them by cellular substance. A single hepatic duct joined the cystic duct about three inches from its termination in the duodenum, and the ductus communis choledocus entered the intestine about four inches below the pylorus. The gall-bladder contained no bile, but about an ounce of a thick brown-coloured opaque fluid, and a small biliary concretion, two lines in diameter, with a rough, irregular and dark-brown surface. This gall-stone was white, and hard internally, but did not effervesce in nitric acid. The spleen, somewhat reniform, and much enlarged and hardened by disease, lay beneath the stomach on the left side. The pancreas resembled that of the rabbit, in form, colour, and situation. The kidneys, 2½ inches long, and 1¼ broad, were placed nearly on the same level, the right being only about a quarter of an inch higher than the left. In the rabbit I have sometimes observed the right kidney nearly two inches higher than the left. The kidneys had the usual regular lengthened form, without any appearance of lobes, which are observed generally in carnivorous animals. The supra-renal glands, attached to the upper and inner margin of the kidneys on the outside of their capsule, were of great size in the Paca, as has been observed also in some other Rodentia. They were of a pale flesh-red colour, 1½ inch in length, half an inch broad, and formed about a twelfth part of the bulk of the kidneys. On laying these glands open, a shut cavity was found in their middle, extending their whole length, the walls of which had a fibrous structure, very much resembling the parenchymatous texture of the kidneys. The use of these glands is not known. Their central cavity was filled with a soft, red, homogeneous substance, like a coagulum of arterial blood. The pelves of the kidneys were very small. The ureters of the diameter of a crow-quill, terminated very obliquely, about an inch from each other, at the lower and back part of a long pyriform urinary bladder. The urinary bladder, consisting of thin and delicate coats, measured 4 inches from the fundus to the neck, when moderately inflated.

The male organs of generation of this animal exhibit a very singular and complicated structure, and, in many circumstances, resemble those described by Daubenton in the Agonti. I found both testicles within the abdomen, and connected in the usual way with the sides of the abdominal ring. From the great width and looseness of the ring on which the testes lay, it is very probable that they descend from the cavity of the abdomen through the ring during the rutting season, as in many other animals. The epididymis was much smaller than that of an ordinary sized rabbit, and formed the lower end of the testicle. The *vasa deferentia* formed two strong white cords, a line in diameter, and considerably longer than those of the Agonti. They passed between the vesiculæ seminales and the bladder, and entered the urethra separately, at a small recess, protected by a fold of the inner membrane, and at the distance of nearly an inch from the neck of the bladder. The *vesiculæ seminales*, lying between the bladder and rectum, consisted of two large hard distended sacs, of unequal lengths, and with very irregular lobed surfaces. The right measured 2½ inches long, the left 2 inches, and they were nearly an inch broad. These sacs were distended with a very thick white opaque fluid, and entered the urethra by separate orifices, in the same valvular recess with the *vasa deferentia.* The *vesiculæ seminales* had no peduncle whatever, but continued broad and lobed to their termination in the urethra, although, in the Agonti, they terminate each in a long duct, before reaching the urethra. Daubenton took from the urethra of the Agonti a long firm white substance with a shining fracture, which appeared to be formed by the hardened matter of the vesiculæ seminales; nothing similar existed in the urethra of the Paca. The two prostrate glands lay on the opposite sides of the neck of the bladder, and below the terminations of the *vesiculæ seminales.* They formed two very soft broad glandular expansions, of a flesh-red colour, and appeared as if composed of several long narrow glands attached to each other. These glands opened directly into the urethra, at the same place with the seminal ducts. As the fringed margins of all these ducts projected freely into the valvular recess of the urethra, their openings were protected by a double valvular apparatus, from any objects passing along the urethra. Two regular pear-shaped glands, which have been met with in a few other animals, but whose use is still unknown, were placed on the sides of the rectum, and in contact with the last caudal vertebræ. The glands were about half an inch in length and breadth, of a dark-grey colour, very soft, and contained a thick grey coloured fluid, which was conveyed by two separate ducts, more than an inch long, into the urethra, at the lower and fore part of the bulb. These glands had a loose cellular internal texture, and their ducts entered the urethra at the distance of two inches from the openings of the seminal ducts. The penis measured 5 inches from the bulb of the urethra to the point of the glans, from the bulb to the entrance of the seminal ducts 2 inches, and these ducts entered the urethra about an inch from the neck of the bladder. The glans penis was

$1\frac{1}{2}$ inch long, and the penis was throughout about half an inch in thickness. The glans was nearly cylindrical, slightly dilated on the fore part, and supported by a complicated bony apparatus. It presented a wide funnel-shaped cavity, unconnected with the urethra, and opening on the fore part by loose soft margins. This cavity, like the whole surface of the glans, was covered with small sharp curved spines, which were reflected backwards on the glans, and forward in the cavity. These spines, when viewed with a lens, were seen to be hollow curved cones, shaped like the horns of the rhinoceros. The whole extent of the upper surface of the glans was strengthened by a bony plate, much expanded at its back part, and affording attachment to two long sharp styliform bodies, whose points reached the anterior extremity of the funnel-shaped cavity of the glans. At the sides of the bony support of the glans, were placed two remarkable serrated osseous wings, with four or five sharp reflected teeth on their free margins. These bony serrated plates were loosely connected with the soft parts of the penis, and rose erect on stretching the integuments to which they were attached; their surface has a smooth shining pearly lustre, like the two sharp styliform bones within the cavity of the glans. The urethra, lying immediately beneath the osseous support of the penis, terminated within the anterior and upper margin of the funnel-shaped cavity.

The great developement and peculiar character of the digestive system of this timid and defenceless animal, admirably adapt it for quickly converting vegetable into animal matter, and for checking the excesses of a luxuriant vegetation in the wilds it inhabits. The remarkably developed state of its generative system, the great fertility of the animal, and its peculiar propensities, cause it to multiply exceedingly in the warm and fertile deserts of the New World, where it dwells secure in its subterranean burrows, remote from the howl of the lion, the leopard, the hyæna, the panther, the tiger, or the other carnivorous monsters of Africa and Asia,—and where its abundant food is neither shared nor trampled by the elephant, the camel, the dromedary, the rhinoceros, nor the giraffe. It has spread so immensely over these waste plains, that it affords an inexhaustible supply of agreeable and wholesome food, already prepared to reward the enterprise and industry of man, in peopling and cultivating the rich solitudes of South America.

VII.—*Sketches of the Comparative Anatomy of the Organ of Hearing, founded chiefly on the Ear of the* SQUALUS.

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(*Read* 19*th November* 1825.)

THE organ of hearing in the Shark tribe varies considerably from that of the human subject. We find neither ossicula auditus, tympanum, eustachian tube, nor cochlea,—but, as if to compensate for the want of parts so essentially necessary to the perfect ear, the semicircular canals are of almost incredible extent. The cranium being composed of semitransparent cartilaginous substance, of a beautiful cœrulean hue, the whole of the organ can be distinctly seen, by merely removing the cuticle, and some of the surrounding parts. When the cranium is divested of the common integuments, a considerable depression is seen in the coronal and posterior portion, which, in the living subject, is occupied by a kind of spongy, elastic, cellular membrane. This depression is of a heart-like figure, the apex pointing forwards, with a roundish process in the posterior part, which causes a partial division of this portion of the cavity.

In the older fish, the intermediate space in the depression between the cuticle and the cranium is chiefly filled with a transparent gelatinous substance, which can easily be seen and felt in the recent subject, by passing the finger backwards over the depression, when the posterior part will become tumid like a bladder. In the posterior and rather inferior and external parts of the depression are four foramina, two of which are situate on each side of the posterior process. The foramen next to the process is large, and of a circular figure, and, in the recent subject, covered with a membrane, the plane of which forms an angle of nearly 45°, with a line through the centre of the cranium, and about the same angle from the perpendicular. This membrane may with propriety be termed the Membrana labyrinthi. The spongy, elastic, membranous substance is attached to the external side of the membrane; but, in the Skate, there is a considerable space between it and the substance. This large foramen leads into the vestibule and posterior semicircular canal, and may be termed the Foramen rotundum, from its circular figure. Close to, and outside of this foramen, is a very oblong aperture, through which the tube of the ear, in the young subject, enters the vestibule, and which, from its extreme oblong figure, may be termed the Foramen oblongatum.

In the young subject of the species *Squalus canus*, the meatus auditorius externus is situate on the superior and posterior or coronal surface of the head, is small, and much contracted, and seldom admits of any substance larger than a strong bristle. The tube is formed of tough, elastic, membranous substance, and runs outwards or laterad, forwards or antinead, and downwards or basilad, a few lines, more or less, according to the size of the animal, until it reaches within a short space of a membrane stretched across the tube, where it enlarges to nearly twice the size of the other parts of the tube. This membrane may with propriety be termed the membrana vestibuli. The tube then describes an angle by running downwards, backwards, and a little outwards, until it reaches the foramen oblongatum, to the edge of which it is attached, in some subjects more closely than in others.

In young fish of the *Squalus canus*, the meatus and auditory tube are more easily found than in the adult, or in some of the other species. In old fish the meatus is generally almost obliterated; the tube and membrana vestibuli are seen, but indurated and enlarged, so as to be scarcely recognisable by the above description. This alteration of the parts may perhaps be the consequence of disease, or the effect of old age. In the ear of the adult of the *Balæna mysticetus*, I have frequently found the stapes so firmly attached to the foramen ovale, that the union resembled ossification, and required considerable efforts to separate the bone from the foramen;—the probable cause of this adhesion will be pointed out, when describing the ear of that animal, so that one fact may, if possible, throw light on another.

The following are the dimensions of the parts in a preparation of the *Squalus canus*, three feet in length.

Distance between the orifices of the meatus auditorius externus, - - - - -	2⅓ lines.
Diameter of the tube at the external orifice, -	$\frac{1}{20}$th of a line.
Do. do. do. inside of the cuticle, - - -	½ do.
Do. do. do. at the membrana vestibuli, - -	1 line.
Length of the tube from the orifice to the membrana vestibuli, - - - - - -	1½ lines.
From that membrane to the vestibule, - -	1½ do.
Depression of the cranium, in length about - -	6 do.

In the species *S. borealis*, or Greenland Shark, the magnitude of the semicircular canals is such, as to surpass any idea which may be formed of the parts from the dissection of the organ in the human subject. The superior size of the parts may be estimated from the dimensions of a cast of the left ear of that animal now before me, which I took a few hours after it was killed.*

The entrance of the meatus internus is about three lines in diameter, and situate in the inferior part of the organ. It runs downwards, and a little outwards, about two lines and a half; then contracts suddenly, and runs horizontally, outwards, nearly a line, when it enters the vestibule, parallel with the floor of that cavity. The vestibule is large, of an irregular triangular figure; the apex of which may be said to be directed towards the brain, while the base runs horizontally outwards and backwards. The circumference of the greatest diameter of the vestibule is twenty-five lines, and the height of the cavity, from the highest to the lowest points, twenty-two lines. On the inside of the superior part of the external angle of the vestibule, is a longitudinal ridge, which, in the sketch of the cast, is seen as a depression; and on the floor there is a correspondent ridge on the opposite side, that runs upwards on the parietes next to the brain, until it arrives at the top of the cavity, where it unites, and forms a septum, which separates the foramen oblongatum from the foramen rotundum. The floor of the vestibule is more tough and hardened than any other part of the labyrinth, particularly that which is directly under the sabulous body, where it has a white, scaly, opaque appearance, approaching towards ossification. The whole of the vestibule is lined with a reflection of the dura mater, which is closely attached to its parietes, where it is considerably less dense than in the inside of the cranium,—

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* See Plate I. figs. 1. and 2., where the parts are shewn of the natural size.

and still less so in the cartilaginous semicircular canals, where it is almost pellucid in the adult fish; and beautifully transparent in the young.

There are three semicircular canals which arise from and communicate with the vestibule, similar to those of the human subject; and from their relative situations to that cavity, may be termed the Posterior, Anterior, and External or Horizontal. The extremities of these canals, adjoining to the vestibule, are considerably enlarged, so as to have a similar appearance to that in the human subject termed the Ampullæ, whereas the proper ampullæ of these cartilaginous canals are situate at a considerable distance from the vestibule, and are of an oblong figure. The posterior canal is the largest, and measures *fifty-three lines*, or nearly five inches and a half in length, and two lines by two and three quarters in diameter. It runs in a longitudinal direction from and to the vestibule, and, when viewed internally, has the appearance of a circle attached to the ampulla of the external canal. The circumference of the ampulla is sixteen lines, and the average circumference of the other parts of the tube eight lines and three quarters. The external canal is the next in size, and measures thirty-six lines in length, and seven lines in circumference. The ampulla of this canal, at its greatest circumference, measures only ten lines and a half. The canal runs in a diagonal direction, the one extremity arising from the superior and posterior parts of the vestibule, and the other from a globular space communicating with the inferior and anterior parts of that cavity. The anterior canal, although the smallest of the three, is yet of considerable size, measuring thirty-one lines in length, and from five to seven lines in circumference.

These canals are partially flattened, so that if any of them were divided at a little distance from the ampulla, the section would be of an oval figure, with the apex pointing inwards.

Among a considerable number of preparations now before me, is one of an elephant (the animal has apparently been of great age), where the caliber of the canals, and of one in particular, is extremely oblong.

When dissecting the organ of hearing in various animals, as well as in the human subject, I have found the caliber of the canals in children, young animals, and birds, to be circular, and, in the adult ear, one or more of the semicircular canals slightly flattened, and this oblong form of the caliber increased considerably in aged persons, in whom it is seldom wanting. The apex in these cases invariably pointed towards the vestibule. Indeed this position seems to be general, whenever the form of the caliber approaches towards an oval.

Seeing, then, that the caliber of these canals is uniformly circular in the young, of whatever class or species,—and that, in the adult, one or more of the canals are generally more or less of an oblong figure, according to the age of the subject,—and that this elongation of the parietes of the canals does not diminish the original diameter, and also, that the caliber of the membranous semicircular canals in the old, as well as in the young, is circular, and always continues so when in a healthy state, notwithstanding any alteration which may take place in the form of the caliber of the osseous or cartilaginous canals; may it not be inferred from these circumstances, that the oblong figure of the caliber is caused by the vibratory action of the membranous tubes exciting absorption of part of the cartilaginous or osseous parietes of the canals in which they are inclosed; and that by the continuance of this excitement the oval form of the caliber is gradually increased?

This view of the subject will receive additional confirmation, if we take into account the myriads of vibrations which the membranous tubes perform in a few years. But how much the more immense must be the number performed by those of the aged, whether the person has frequented the busy haunts of the metropolis, or the more peaceful calm of rural solitude. Such are the dimensions of the cast, taken with the greatest care, which will be sufficient to demonstrate the superior magnitude of the cavities to those of the human ear; and the following account of the contents of the vestibule and canals, the result of a series of dissections of the membranous parts and nerves in various species of the Squalus, will, I hope, tend to place comparative anatomy, as regards these organs, in a more advantageous point of view, than usually esteemed by many of the profession.

When the ear of the shark is dissected immediately after the animal is killed, the appearance of the parts, to the young anatomist, is novel and unique. The transparency of the cerulean cranium, membranous canals and sac, and liquor contained, forms a most beautiful preparation, and, at the same time, an elegant and useful view of the membranous parts of the organ of hearing. The cavity of the vestibule is chiefly occupied by a large membranous sac, which, in the young recent subject, is thin, delicate, and transparent. This sac is of an irregular triangular figure, the body running horizontally outwards; while the parts next to the brain shoot up considerably beyond it, and are lost in the anterior and posterior canals. The body of the sac runs outwards until within two lines of the extremity of the vestibule, when it terminates in a remarkable process that descends nearly two lines downwards and forwards, below the base of the sac, and there turns inwards, and sometimes slightly upwards. Immediately below there is a considerable depression, or little pit, in the floor of the vestibule, in which this process is situate; so that it is sunk beneath the level of the other parts of the sac, and also below the floor of the cavity. There is, however, sufficient space in the fossæ to allow of a considerable degree of motion in the process, without touching the bottom or sides of the depression.

The form of this process, in various cartilaginous fishes, approaches gradually towards that of the shark, according to the approximation of their voracious habits.

Thus, in one species of the Ray, it is continued horizontally outwards from the end of the sac. In the Thornback it is slightly curved, with scarcely any perceptible fossa in the young; while, in the adult, that depression resembles the fossa of the young Squalus caninus. I have termed this process the *angorian appendage*, from its containing the cornu angoriana, which will be described in the account the distribution and termination of the auditory nerve.

In the cartilaginous floor of the vestibule, there is oblong depression nearly eight lines in length, of which the fossa angoriana forms rather more than one-third; the other parts being filled with a semicartilaginous substance, that surrounds, and forms a bed for a nerve that shall afterwards be noticed. This substance is covered by the membrane that lines the vestibule, which dipping downwards into the cavity, divides the oblong depression, and in that manner forms the inner side of, and lines, the fossa angoriana. This great membranous sac measures upwards of eight lines in length, and four lines in diameter, and is, as formerly mentioned, chiefly situate in the interior parts of the vestibule, to which it is firmly attached.

On the anterior side, and close to the cartilaginous septum, the sac sends a slender process upwards, which is attached to the foramen oblongatum, and proceeds upwards, and reaches the membrana vestibule, which stretches across and divides the tube, and thence to the orifice of the meatus, situate on the coronal surface of the head, as formerly mentioned. In the young subject of the Squalus caninus this process is easily found, and will admit of a large bristle; but in the adult it is extremely small, sometimes scarcely discernible *. It is beautifully seen in the Thornback, and is of a trumpet-like form; but the caliber is so small when it reaches the upper part of the vestibule, that it will not admit of a substance thicker than a human hair. The sac consists of two fine transparent membranous layers, between which are situate an almost innumerable multitude of vessels, glands, and nervous filaments. There are numerous short lines of a serpentine figure, which appear more bright than the other parts, and these are formed in a range of semitransparent points resembling minute glands; so that I am persuaded these glands secrete the gelatinous humour in the sac. It likewise appears to be plentifully supplied with nervous filaments from the sabulous plexus. We must therefore suppose that the sac is possessed of great sensibility, and consequently of muscularity similar to the iris, but in a less degree; and that, when the liquor amplexus is agitated, the sac itself assists in communicating the vibrations to the sabulous humour and semicircular canals.

In order to keep this great sac extended, there is a strong ligament that arises from the upper and anterior part of the body of the sac, directly above the process; which runs straight outwards, and is attached to the opposite and anterior extremity of the vestibule. By means of this ligament, and the reticulated cellular body, the supe-

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* Toward the latter end of this essay, I shall endeavour to shew the utility of this gradual contraction of the meatus externus.

rior part of the sac is kept partially flattened. This ligament may with propriety be termed the Ligamentum extensorum.

The great sac is chiefly filled with a transparent gelatinous semifluid, of the consistency of the vitreous humour in the human eye, and resembles it more than any substance which I have seen, and may, from its situation, be termed the Sabulous Humour.

I have not been able to detect any membrane holding this humour in separate cells, similar to the membrana hyaloides in the human eye.

There is also a peculiar substance in the lower and posterior parts of the sac, formed by the termination of the filaments of the sabulous plexus, which deserves the most careful investigation; the structure of which shall be described in the account of the distribution of the auditory nerve. This substance I have termed the Sabulous Body. The inner and anterior parts of the sac are connected with a globular membranous cavity, by means of the parts being extended so as to form a tube of communication, about two lines in length, and a line in diameter.

This cavity, from its figure, deserves the name of the Spherical Sac, is from three to four lines in diameter,—of a globular figure, communicating on one side with the great sac, and on the other with the ampullæ of the anterior and horizontal canals, and closely attached to the inferior parts of the cartilaginous cavity in which it is situate.

In several species of the cartilaginous fishes, the anterior canal is given off by the great sac, and the horizontal or external canal is derived from the anterior canal, just before the expansion of the anterior ampulla.

The beginning of both of these canals are in these cases firmly connected to the upper part of the spherical sac by membranous substance, so that whenever any undulations affect the canals, the vibrations are instantly communicated to the sac.

The spherical sac, in these animals, is connected with the great sac by a short membranous tube, similar to that which we find in the shark. In the inside of the spherical sac of the shark, as well as in that of the other cartilaginous fishes, the nerves terminate in a remarkable manner, which will be described in the account of the distribution of the auditory nerve. The structure of this sac is similar to that of the great sac, but more strong and elastic; and it may be remarked, that nearly the whole of the cavity in which it is lodged is occupied, particularly the inferior parts, to which, as formerly mentioned, it is firmly attached.

There are three membranous semicircular canals which terminate in the great sac, and occupy the centre of the cartilaginous canals. These may be termed, from their situation, the *posterior*, *anterior*, and *horizontal* or *external*.

The posterior membranous canal forms a circle, and has but one passage into the great sac, which is situate on rather the posterior side of the canal and upper part of the sac, and nearly in a line, sometimes rather above the upper edge of the sabulous body. The anterior side of the tube is in contact with, and firmly adhering to the posterior part of the end of the anterior canal. In the Thornback there is a small funnel-shaped tube, of about four or five lines in length, which leads from the posterior canal as it begins to descend, opens into the great sac, and forms the common aperture.

The common opening of the posterior canal of the Shark is formed so as to resemble a tube of communication, but the length seldom exceeds half a line. The superior part of the canal is firmly attached to the roof of the vestibule, which causes it to form an acute angle, anterior and superior to the entry of the tube into the sac.

The perpendicular part of the canal is very large as it descends to and from this common aperture, being nearly six or seven times larger than any part of the tube, and is separated (below the opening) from the sac by a slight cartilaginous septum, which runs inwards, and then upwards, and assists to form the division between the foramen oblongatum and the foramen rotundum.

When the tube is nearly within a line of being on a level with the floor of the vestibule, it describes a gentle curve, running backwards, and contracts in a little space to within one-half of the size of the longitudinal part. The perpendicular part of the tube, and its curvature, to where it contracts, is very thin, delicate, and transparent, and is closely attached to the cartilaginous parietes; but becomes tough and strong when it emerges into the enlarged cavity, where, in the space of a line and a half, it gradually increases, and forms a globular expansion that has been denominated the Ampulla, and which is the largest in the organ. It then contracts, and forms a strong, tough, membranous tube, which runs backwards, upwards, and forwards, so as to describe an irregular circle, until it arrives at the superior part of the vestibule (directly above the anterior parts of the great sac), to the roof of which, as formerly mentioned, it is firmly attached.

The other two canals arise from the spherical sac, which gives to the parts a somewhat clustered and irregular appearance, owing to the ampullæ of the anterior and horizontal canals being situate close to the sac; and this is rendered still more so, by the great quantity of nerves with which the expansions of the tubes are surrounded.

The anterior canal emerges from the upper part of the spherical sac, and, running upwards nearly a line, dilates into a round cavity, which forms the ampulla. It then contracts to the size of the diameter of the posterior tube, and runs backwards with a gentle curve, so as to describe nearly a semicircle, and terminates in the inner, anterior, and superior part of the great sac.

The external canal arises from the external and rather superior part of the spherical sac, and passing horizontally outwards, and then inwards, with a circular sweep, completes the semicircle, and opens into the great sac near to, but rather above, the entrance of the posterior canal.

The ampullæ of the horizontal and anterior canals are considerably above the level of the posterior ampulla (in its natural position), owing to the meatus internus, and also the spherical sac, being placed below them. The walls of the membranous canals are strong, elastic, and very thick, when compared with their caliber; but do not occupy one-third of the caliber of the cartilaginous canals. There is little perceptible difference between the membranous canals of the young and those of the adult, except in size—and that is chiefly observable in length, the diameter of the canals increasing very little in proportion to the age of the animal. The membranous tubes of the Skate do not fill above one-fifth of the caliber of the canals. The intermediate space in both is partially filled with transparent reticulated membranous substances, resembling somewhat the cordæ tendineæ in miniature, but extremely slender, which connect and retain the membranous tubes at an equal distance from the sides of the cartilaginous canals, support the vessels of nutrition, and convey them to and from the tubes, while, at the same time, the elasticity of the fibres admits of considerable vibratory action in the canals. The membranous canals are very vascular, but in the healthy state do not admit any of the red globules; and in the aged become nearly cartilaginous, so that a great degree of inflammation must ensue before any of these globules can pass.

In a preparation now before me, where the subject had been killed by repeated blows on the head, the vessels leading to the canals were quite turgid, and of a red colour. The space between the membranous fibres and the canals is filled with a clear fluid, similar in appearance to water, but of a saltish bitter taste, and is a continuance of the surrounding fluid of the vestibule; and from this circumstance, the vibrations can be more rapidly communicated throughout the labyrinth than without this provision.*

The membranous canals are filled with a transparent fluid, which has no direct communication with that contained in the interspaces surrounding the tubes, for, when a section is made of the cartilaginous canals, the fluid in the interspaces oozes quickly out, while the membranous canals continue full and distended. Close to and upon the extremity of the great sac is the base of a large oblong substance, smooth outwardly, but full of reticulated elastic membranous substance.

We noticed above, that a ridge or process ran, on the floor of the vestibule, the whole length of that cavity, and likewise a corresponding process in the superior part, which caused a partial longitudinal division of the vestibule, and formed, as it were, beds for the lodgement of two bodies. In the anterior division is the great sac, containing the sabulous body; and close to it, on the posterior side of the process, is the body of this oblong reticulated membranous substance, with its extremity resting on the great sac as on a cushion. This substance, contracting gradually, makes a half turn outwards, and, mounting upwards, enters the anterior cartilaginous canal, and is attached to the superior curve of the membranous tube.[*]

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* The liquor in the vestibule and cartilaginous canals of the Thornback, measured about two drachms of a transparent fluid, the taste of which was similar to salt water, but not quite so strong.

The great sac and this elastic oblong substance are both attached to the parietes of the vestibule by long slender membranous fibres, which intersect the vestibule in various directions, but admit of slight elongation; and, consequently, when these bodies are affected by the agitation of the surrounding fluid, the membranous fibres will assist to controul and mitigate the effect of powerful or violent vibrations, and, at the same time, secure the sac in its natural position.

As this fluid surrounds the membranous sac in the vestibule, and its ramifications in the canals, so it may from that circumstance be termed the Liquor Labyrinthi amplectens; and that which is contained in the sac and tubes, the Liquor Labyrinthi inclusus.

The ear of the Skate bears a great resemblance to that of the Shark, so much so, that I have endeavoured to compare the one with the other whenever an opportunity occurred. The ampullæ and semicircular canals are as large in diameter, and the vestibule of greater magnitude, particularly the superior parts of the cavity; but the cartilaginous canals are shorter, and lie close to the vestibule; and, indeed, great part of the membranous tubes is contained in that cavity, the cartilaginous canals being apparently of no other use than as so many loop-holes to keep the membranous tubes from intermingling with the sac; and this gives them a seeming deficiency in length, and an appearance of clumsiness, when compared to the magnificent circular sweep of those of the Shark.

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[*] The parts of this organ appear admirably adapted to the purposes for which they seem intended. Thus, this organised reticulated membranous body in the adult, is composed of only a few delicate, and almost invisible, membranous fibres in the young.

I have therefore selected the ear of the Squalus borealis, as containing the best specimen of the auditory canals, not only because of the elegance, superior size, and tangibility, of the parts,—but likewise for the similarity of the membranous tubes to those of the human subject, in respect to form and position,—of which they form the finest illustration that is found in the animal kingdom.

The auditory nerve of the Squalus is large and very tough, when compared to that of the human subject, and composed of numerous fasciculi which divide in the meatus internus, into four, sometimes five, tolerably large branches. A branch leaves the anterior and inferior parts of the meatus, by a small foramen in the cartilaginous substance of the cranium, and gives off numerous branches that ramify in a large duct which leads from the coronal surface of the head to the orbit.

The nerve then passes outwards, and is distributed on the sides of the head.

In the superior part of the meatus, there is a small fossa containing two foramina, the one rather superior and anterior to the other.

The superior and anterior branch enters the anterior-superior foramen, and, proceeding upwards in a small canal, contained in the cranium, runs upwards and forwards, and a little outwards, until it arrives in the cavity of the horizontal canal destined for the reception of the ampulla.

It then divides into two branches, which stretch outwards and upwards, and perforate the membranous ampulla near the centre, on the inside of which the filaments are distributed, chiefly on the inferior parts of the cavity.

As soon as the nerve divides, it sends numerous small filaments to the inferior parts of the ampulla, which penetrate the membranous expansion, and form on the inside a delicate nervous process, in the direction of the circular part of the lower half of the ampulla, so as to join the two branches, independent of the central inosculating fasciculus. These inosculating or uniting processes have a beautiful flocculent appearance, somewhat tinged with the cerulean hue of the surrounding cartilage.

In a preparation of the thornback now before me, the nerve divides and penetrates the membranous ampulla, in a similar manner to the above, near the centre, each branch forming a small mamillary process on the inside of the cavity. These processes send each a delicate branch, that forms a nervous fasciculus, extending across the centre of the ampulla, and uniting with its fellow on the opposite side. By this provision, the slightest vibratory motion of the surrounding fluids or liquor contained in the tube will affect this nervous circle.

A large bundle of delicate filaments enters the other foramen in the meatus of the squalus, which leads to the cavity occupied by the spherical sac, where it divides suddenly into twenty or thirty slender branches, the greater number of which proceed upwards, and almost completely cover the inner, anterior, and posterior parts of the sac.

It may be remarked, that each branch as it divides unites with the branch next to it on either side, which also in its turn divides and unites in the same manner, and so on, alternately dividing and uniting during their course upwards, until the whole of the fasciculi are intimately connected, and form a beautiful plexus of nervous filaments that nearly covers the sac.

This plexus gives off numerous filaments, some of which perforate the sides of the membranous spherical sac, and unite with others that enter by the bottom of the cavity, and form a substance of beautiful white particles, similar to those of the sabulous body in the great sac, but more minute than that substance is, in the young fish.

Other branches are given off, and distributed on the membranous sac itself; so that, from this circumstance, it may be supposed to possess a certain degree of muscularity.

The whole of the filaments forming the spherical plexus unite above the sac, and form a strong nerve, which runs upwards, and with a gentle curve inwards, and then rather outwards, until it arrives at the upper and rather anterior part of the ampulla of the anterior canal, where it enters that membranous expansion, on one side, in numerous filaments.

This mode of perforation, by only one side of the ampulla, is peculiar to the nerve distributed on the horizontal canal. The nerves which supply the ampullæ of the anterior and posterior canals, divide each into two branches, the filaments of which perforate the ampullæ on opposite sides.

A fourth branch, by far the most important of the whole, if we judge from its size, distribution and termination, enters the vestibule, and, proceeding outwards, gives off numerous branches, until it is expanded on the inside of that cavity, and forms one of the most beautiful plexus to be found in this organ.

On the first view of the parts, one would be inclined to suppose that the plexus arose from a nerve sent to the posterior canal. Indeed I have dissected several ears where the posterior nerve gave off the plexus. But if a preparation of the parts in the adult be carefully examined, especially when partially dried, it will easily be ascertained, that the nerve which is distributed on the posterior ampulla, derives its origin from this branch, which may be termed the Sabulous Nerve, from the peculiar properties of its fasciculi.

The posterior branch or nerve separates from the sabulous nerve, as soon as it enters the vestibule, and, diving into a small foramen, is separated from the plexus by a thin cartilaginous septum, which, being transparent, allows of the posterior nerve being seen through the cartilage, and thus causes the above appearance.

This nerve proceeds in a direct line, until it arrives near the ampulla of the posterior canal, where it emerges and divides into two branches, the filaments of which embrace and perforate each side of the membranous ampulla, on the inside of which they are distributed in a similar manner to the superior-anterior branch on that of the anterior ampulla.

As soon as the sabulous nerve has given off the posterior branch, it runs outwards, and rather backwards, gives off numerous slender branches (that run forwards), and, as it advances, gives off a large branch, containing above one-third of its filaments; which branch runs outwards, and rather forwards, and divides in numerous branches that unite with a strong nerve of a semicircular figure. This nerve, which may be termed the Nervus communicans, from its uniting with most of the branches of the plexus, extends from the fossa angoriana the whole length of the vestibule; the one extremity assisting in forming the cornu, and the other uniting with a small branch, given off by the sabulous nerve, as it enters the vestibule.

This communicating nerve gives off numerous short twigs which run forwards, supply the anterior parts of the vestibule, and contribute materially in forming the plexus. It likewise unites with a small nerve, that enters a foramen about three or four lines anterior to the meatus internus, and which, passing outwards, arrives in the oblong depression situated under the anterior edge of the plexus, as formerly mentioned, in which it is surrounded by the elastic semi-cartilaginous substance.

After being united to the plexus by means of the nervus communicans, it proceeds outwards enveloped in the substance, and, keeping rather behind and below the fossa, enters a large canal in the substance of the cranium. The nerve, enlarged now to nearly three times its original size, appears, when viewed from without, as if it sent a branch to form the plexus, and another to the cranium, instead of its being only an auxiliary, enlarged by means of the union of filaments from other nerves. This nerve, after leaving the cranium, is distributed on the neck, and parts adjacent. The sabulous nerve, as it proceeds, gives off several slender branches, and afterwards another large branch, that divides into two branches, and each of these again into others, more minute, which also unite with the communicating nerve. It then divides into six, eight, sometimes ten, long slender branches, which run outwards, and dip into the fossa, where they form the horn-like process of the sabulous body.

The above is the distribution of the branches on the anterior side of the nerve. On the posterior side, the sabulous nerve gives off six, sometimes seven, long slender branches, one or two of which pass through, and are distributed in, the upper parts of the vestibule, but the most of them supply the superior and posterior parts of the great sac; and we may infer, from these circumstances, that the sac itself, as formerly mentioned, is susceptible of the vibrations of the liquor amplectens.

In a preparation now before me, one of these slender branches runs to, and is distributed on, the membrane stretched over the foramen rotundum; so that the reciprocal vibrations of that membrane with those of the membrana vestibuli, are thus instantaneously transmitted to the sabulous plexus, in order to rouse or call into action the sensitive qualities of the termination of its fasciculi.

In the thornback, there is a beautiful long slender nerve given off at the beginning of the plexus, which runs upwards, and is inserted into the substance of the great sac, near the opening of the posterior canal into the sac.

The above is the most frequent manner in which the branches are distributed in forming the plexus; but, in a very old shark, I met with the following arrangement, which, as it had a beautiful appearance, and was rather uncommon, at least to my experience, I shall take the liberty to describe in as few words as possible.

The sabulous nerve, on its entrance into the vestibule, divided into four branches, three of which were extremely slender, while the fourth (anterior to them) was larger than the three put together. This large branch ran outwards, forwards, and then backwards, so as to form an oblong semicircle of six or seven lines in diameter, where it united with the other three slender branches which ran obliquely outwards, and formed a line parallel to the diameter of the oblong semicircle. These three slender branches passed into the fossa, and formed the cornu. The large branch, which might be termed the Nervus semicircularis, from its curvature, and which is precisely the nervus communicans of our former description, gave off many branches. Those that were on the inside, or posterior to the nerve, proceeded obliquely towards the long slender branches, and, in their course, gave off numerous slender filaments, that united with the other branches, so as to form a beautiful plexus, similar to the spherical plexus, but more extensive.

The plexus was of an oblong semicircular figure, and connected so as to resemble a net, the meshes being formed by the branches and filaments, as above, while, at the time, they gave off numerous minute filaments that pierced the great sac, and terminated on the inside in a remarkable substance. This substance is the same in both modes of distribution; and, from the gritty sensation that is felt when rubbing part of the substance between the finger and thumb, it may be termed the Sabulous Body. This remarkable substance occupies the posterior, inferior, and inner parts of the sac; is of an oblong figure, sometimes partially concave, but generally with an irregular surface in the adult, and terminates in a horn-like process that shoots downwards, and a little forwards, and sometimes slightly inwards, and which, from its resemblance to the horn of the ram of Angora, may be termed the Cornu Angorianum. The body of this substance (independent of the process) measures from six to eight lines in length, four in breadth, and from two to three lines in thickness. These measurements vary according to the age and size of the subject.

In the very young fish of the species Squalus Caninus, the whole of the substance is of a dark blue colour; but, as the animal grows older, it changes to that of a light grey.

I have seen it sometimes in the young fish, coloured so as to appear to consist of three divisions; the upper division of a dark blue colour, intermingled with a few lighter particles. The middle and largest of the divisions of a cream colour, with a few dark particles; and the division next to the plexus, which formed only one-third of the extent of either of the other divisions, composed of white particles.

In the large shark, and several species of young skate, the particles are white, and consequently finer in the latter than in the former, where they are seldom found of that colour, except in the adult. Hence the opinion of several anatomists, that these bodies are chalky concretions. It should, however, be recollected, that all parts of the system, in the healthy state, are organized; and although we should meet with substances, such as the above, the nature of which, at first sight, may appear inexplicable to us, yet, with careful dissection, and the aid of microscopic instruments, the structure of the parts may be developed, their connection traced, and a new field opened to the physiologist.

But let us resume the examination of this interesting substance. The sabulous body is composed of an almost infinite number of hollow, globular particles, and of a greater number of nervous filaments, with several pellucid vessels destined to the nutrition of the parts. These nervous filaments arise from the minute fasciculi of the sabulous plexus, after they have perforated the great sac, and are so extremely minute as to elude the naked eye, unless aided by the compound microscope. By the help of this instrument, we can trace these delicate filaments, which resemble a piece of moss in intricacy, and are so intimately connected as to form of themselves an oval cubic plexus of the figure of the sabulous body. These filaments unite and bifurcate alternately, so as to form an assemblage of numerous circular and oblong, but chiefly angular figures; and, in their course, give off numerous branches that ramify towards the centre of the figures. The gelatinous substance, or humour, dips down between these divisions, so as to fill up any interstices, and likewise form a bed for the pellucid vessels that nourish the parts.

These divisions or compartments, whether circular, oblong, or angular, are formed by the filaments and junction of numerous globules that are connected in the young animal by a delicate transparent membrane, so that each of these divisions that appear through a common glass to form only one body or particle, encircled with arborescent filaments, is in fact a conglomerate body.

When a very small portion of the recent globules is examined by a good microscope, each of these small twigs that branch from the uniting filaments which form the divisions, is seen to enter an extremely minute globule, and terminate on the inside of the transparent globular particle, in almost invisible fasciculi. As the animal grows older, the minute globules burst the confining membrane, and hence the reason why the globules appear so minute in the adult compared with the young animal.

The Angorian process is sometimes found detached from the sabulous body, of which it forms a part. When too great a gap or space occurs between this process and the main body, may it not be a defect or injury? No doubt, when the organ has been actively employed, the long continuance of oscillatory vibration may cause partial absorption of some of the globules, near the beginning of the process; but I am inclined to suppose, that when there is a deficiency of globules, so as to separate the process from the body, the vacuity is, in these instances, owing more to disease, injury, or defect, than to the healthy action of the parts.

The sabulous body is easily detached from the nervous filaments whence it originates; and separates generally in a mass with sometimes a small quantity of nervous fasciculi adhering to the inferior part. It is, however, not so easily separated when the animal is recently killed, as when it has been dead four or five days; and we may infer, that, when the fish is alive, it is still more firmly attached, so as to withstand any sudden shock to which the animal may be exposed. And, as it is seldom caught without making an obstinate resistance, so we may likewise conclude, that the sabulous body may receive great injury from that cause, independent of the fragility and delicacy of its structure; and these circumstances may account for its being so often found separated, as to have led to the vulgar belief of its being a separate body, unconnected with any of the surrounding parts, and of a petrous nature.

When the substance is dried, and examined by the rays of the sun, the parts appear to great advantage; the white conglomerate particles assume a crystalline appearance of the most dazzling brilliancy, which is beautifully contrasted with the dark particles, that are of a purple colour. The encircling filaments appear like small silvery cords; but, in general, are so shrunk as scarcely to be recognized, and are seldom or never seen, unless the portion examined be very small.

When a dark-coloured particle is divided by a fine instrument, a nucleus of white substance is often seen in the centre of the particle or globule, of more or less size, according to the age of the animal. We may therefore suppose, that a deposition of the white-coloured particles takes place in the centre, and accumulating, presses upon, and so causes the gradual absorption of the surrounding dark coloured substance.

In several preparations now before me, both of the shark and skate, there is a beautiful continuation or chain of delicate minute globules, which arises from the inner edge, and middle part of the sabulous body, pierces the gelatinous humour, and is united to the fine particles of the substance contained in the spherical sac.

The globules are connected by numerous filaments, similar to those of the sabulous body.

These communicating fibres, and the line of globules, are found only in the adult; and hence one reason why the meatus should be more contracted in the adult than in the

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Fig. 3.

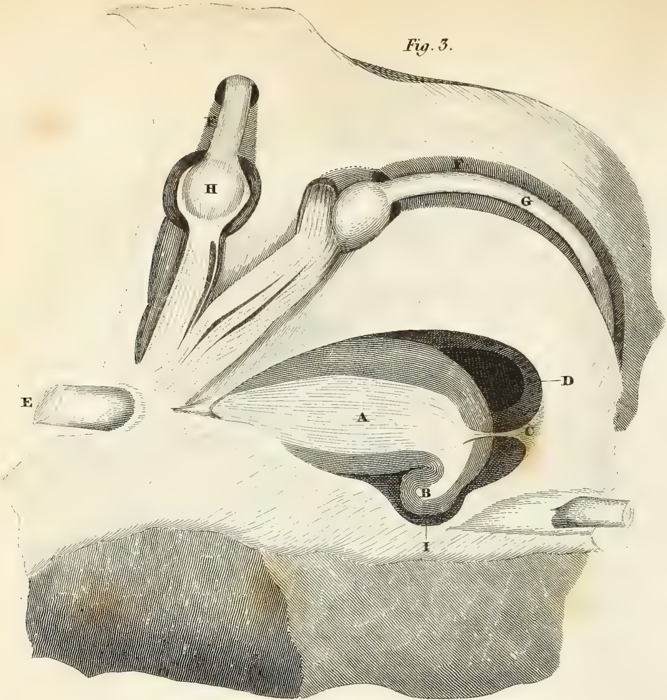


Fig. 1.

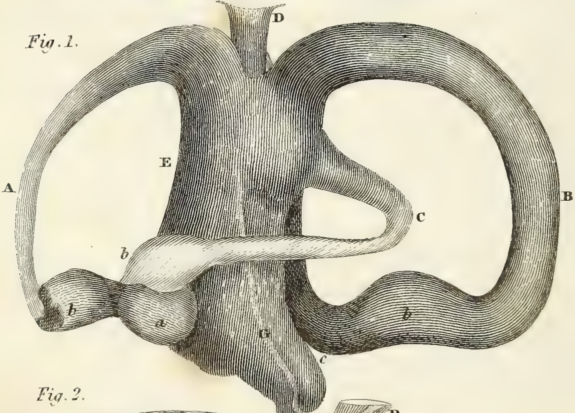
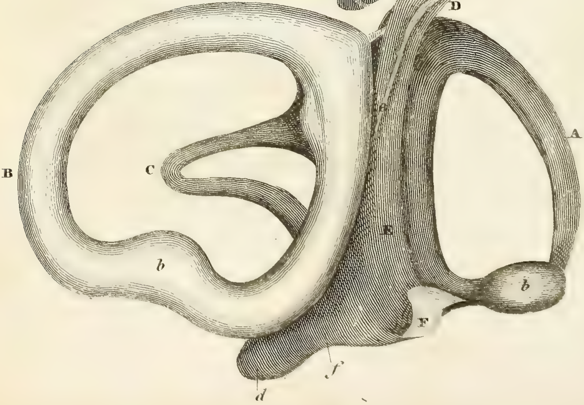


Fig. 2.



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young animal, in order to preserve the parts from being injured by the frequent application of strong vibrations.

In order to have a full view of the beauties of this extraordinary substance, let a portion of it be taken from the young animal, and carefully dried, and then placed in the focus of the rays emitted by a candle, during the day, so as to cause the parts to assume a slight reddish tinge, and examined in this position. The appearance of the parts is delightful, beyond expression; the sight is truly enchanting. The most elegant specimen of crystallization that I have seen, appears paltry when compared to the magnificent termination of the sabulous nerve. Indeed nothing *can* surpass the golden hue of these transparent crystals. The fairy scenes of Alladin's far-famed cave appear depicted in all their glowing splendour and luxuriant riches. Myriads of the most beautiful crystals lie piled in heaps, and form a boundless range of wild irregular groups, whose varied forms baffle description, but on which the eye dwells with delight.

PLATE I.

References to Figs. 1. and 2. of which the former is the external, the latter the internal view of a cast of the Labyrinth of Squalus caninus.

A, the posterior cartilaginous canal.		
B, the anterior	do.	do.
C, the external	do.	do.

a, Cavity for the reception of the spherical sac.
b, The ampullæ.
c, Exit of the portio dura.
d, Situation of the Angorian appendage.
e, Septem.
f, Situation of the sabulous plexus.

D, Part of the cavity of the vestibules, formerly cccupied by the reticulated membranous substance.

E, The auditory nerve ; part of the meatus internus cut away.

F, The anterior and posterior cartilaginous semicircular canals.

G, The membranous horizontal canal.

H, The ampulla of the anterior membranous canal.

I, The fossa angoræ, containing the cornu angoræ and angorian appendage of the great sac.

The parts appear more elevated than in their natural position, in order to comprehend as extensive a view as possible.

PLATE II.

Fig. 1. A view of the spherical plexus of the Squalus canini—four times the natural size.

A, The spherical branch of the auditory nerve.

B, The plexus embracing the inner and posterior parts of the spherical sac.

C, The termination of the short filaments of the spherical branch seen through the sac.

D, The united filaments making a kind of half-turn, and perforating the ampulla of the horizontal canal.

Fig. 2. View of the distribution of the branches forming the sabulous plexus—four times the natural size.

A, The sabulous nerve, the branches of which form the plexus. Sometimes the nerve is awanting; in these instances the posterior nerve gives off branches to form the plexus.

B, The nervus communicans.

C, The fossa angoræ, the dark shaded parts below the communicating nerve is the depression covered by the membrane that lines the vestibule.

D, The horizontal canal.

Fig. 3. The appearance of a portion of the Sabulous Body of the Squalus canini, as seen through the compound microscope—parts coloured agreeable to nature.

PLATE II.

Fig. 3.

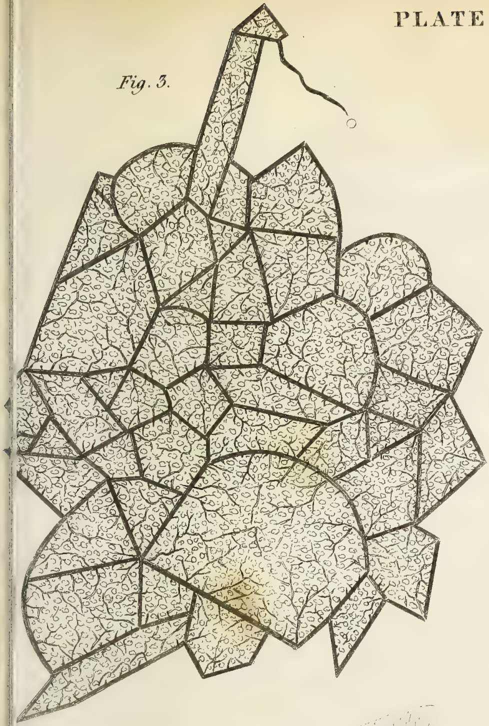


Fig. 1.

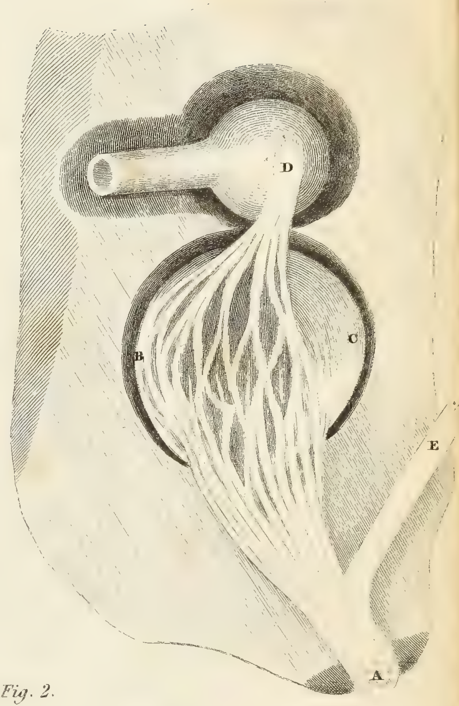
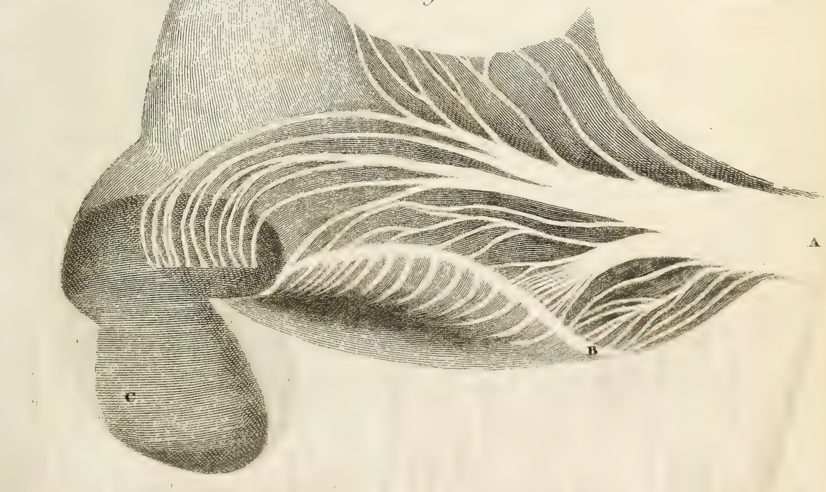


Fig. 2.



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BRITISH MUSEUM

VIII.—*On the Fossil Remains of Quadrupeds, &c. discovered in the Cavern at Kirkdale, in Yorkshire, and in other Cavities or Seams in Limestone Rocks.*

By the Rev. George Young, A. M.

Corresponding Member of the Wernerian Natural History Society.

(*Read 30th November* 1822.)

PART II.

In a former paper, communicated to the Society in May last*, I gave an account of a remarkable collection of bones and teeth, belonging to the elephant, rhinoceros, hippopotamus, hyæna, stag, and other animals, found in a cavern, in the oolite-limestone, at Kirkdale, in Yorkshire; and noticed, at the same time, a few similar collections of animal remains discovered in limestone. In that paper, I confined myself to a simple detail of facts and appearances, proposing to inquire, in a future paper, how such collections of relics may have been formed. This design I have been much longer in fulfilling than was intended; partly from the hope of availing myself of any additional light which might be thrown on the subject by new discoveries, of which there was some prospect; and partly with a view to compare my sentiments on the subject with those of others, particularly with those of the Reverend Professor Buckland, whose interesting account of the Kirkdale Cavern, and its contents, has been published in the Philosophical Transactions of the Royal Society of London. Knowing, from my correspondence with the learned Professor, that his sentiments were at variance with mine, I wished, before writing my second paper, to have a full view of his statements and reasonings—that his hypothesis and mine might be compared with more advantage.

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* Memoirs of the Society, vol. iv. p. 262.

The Reverend and Learned Professor is decidedly of opinion, that Kirkdale Cavern must have been, at the Deluge, and for ages before it, a den of hyænas, whose remains form so large a proportion of its contents; and that the other relics entombed there belonged to animals, or portions of animals, which the hyænas had dragged into the cavern to devour or to gnaw. He supposes that the Deluge, to which he seems to ascribe only a very partial change of the earth's surface, closed up the cave, with the bones contained in it, after depositing over the latter a thick sediment of mud, which he conceives to have been the means of their preservation. The opinion which I hold, in opposition to this theory, and which is already published in the Geological Survey of the Yorkshire Coast, is, that, as immense numbers of animals of all descriptions were drowned by the Deluge, vast masses of animal matter must have been floated or drifted about in all directions, and quantities of this matter descending to the bottom, while the diluvian waters yet covered the present strata, might be drifted into such chasms or fissures of rocks as were then open, great part of which might be subsequently covered up by the deposition of the alluvial beds at the final retiring of the waters; and that, as the bones and flesh of the animals, by being long tossed about, would be broken, mangled, and mixed in wild confusion, the accumulation of such mixed relics as were found in Kirkdale Cavern may thus be accounted for.

In some things the Professor and I are pretty well agreed, particularly in thinking that the bones have been preserved in the cavern since the era of the Deluge; and that the different kinds of animals to which they have belonged, might all have lived in this quarter of the globe previous to the Deluge,—though many of them, in consequence of the changes produced by the flood, are now peculiar to the tropical regions. In our descriptions of facts and appearances, there is also no material difference. He has made mistakes, in a few instances, through inadvertence; as, in naming the *beck*, or rivulet of Kirkdale, in one place *Rical* Beck, instead of *Hodge* Beck; and in stating that the *elevation* of the Cave above the bed of that stream exceeds 100 feet, where he has obviously substituted the *distance* for the *elevation*, the perpendicular height of the mouth of the Cave above the level of the *beck* being only about 36 feet, and the whole height of the bank, at that spot, scarcely exceeding 60 feet. The most considerable difference between our statements is, that the Professor roundly asserts, that, "In the interior of the cave there was not a single rolled pebble, nor one bone, or fragment of bone, that bears the slightest mark of having been rolled by the action of water;" whereas I have affirmed, that many of the bones are decidedly water-worn. Here, however, Mr Buckland's account does not vary from mine in the statement of the fact, so much as in assigning the cause of it; for, in another passage of his essay, he observes, that many of the bones are worn and polished, at least on one side; but, instead of allowing them to be *water*-worn, he supposes them to have received their polish by being trampled on by the hyænas in the bottom of the den. It is stated in the Geological Survey, that "the bones had scarcely any appearance of being water-worn;" and this is true of most of those that were found at or near the entrance of the cave: but the bones from the interior, and especially from the extremities, of the cavern, bore more decisive marks of friction; and in a large collection, which I saw after the publication of the Survey, and which had been brought out from the remote branches of the cave, I could scarcely observe one specimen that was not obviously worn. This circumstance may go a great way towards deciding the cause of their being worn; for, on the supposition of their being water-worn, it is natural to expect, that the bones which were projected farthest into the cavern, being most rubbed against the sides, and against one another, would be most rounded and polished; whereas, had they been worn smooth by the feet of the hyænas, those which lay in the first part of the cave, the grand thoroughfare to all its chambers and branches, would have acquired the highest polish, or been most worn.

In supporting his hypothesis, the learned Professor lays much stress on a fact which he observed, that several of the bones are polished on one side, and not on the other; which is the case, particularly with the jaw-bones and other curved bones, the convex side being smooth, while the concave side is rough: but, whether we consider them as worn by being trampled on, or by being rolled and drifted about by water, the convex side, being most exposed, would necessarily be most worn. Mr Buckland alleges, that the ends of such bones are not rounded, but remain sharp. To a certain extent this may be admitted; yet in hundreds of specimens which I have examined, the ends are obviously worn and blunted; though, where the bone terminates in a fracture, we cannot expect the same degree of polish at the ends, as where the bone is entire, and naturally presents a smooth surface; especially as these sharp ends would be liable to repeated fractures, in striking against the rocks. Besides, it is not easy to see how the ends of the bones should be sharp and untouched, if they were polished by the hyænas, for they would be kicked about in the bottom of the den in all directions. Mr Buckland, indeed, speaks of their getting fixed, like the stones of a pavement, by being pressed down into some soft substance on the floor of the den; but, by his own hypothesis, the mud was not introduced till the Deluge, when the process of polishing ceased;—and what other soft substance did he find, in which these polished bones were fixed and imbedded?

A misconception as to the situation in which the bones were found in the mud, seems to have made the Professor overlook what appears to me the true cause why some bones are polished on one side, and rough on the other. He speaks as if the bones were all lying on the floor, *covered* by the mud, the latter forming a stratum over them, which behoved to be removed before the bones were seen, and which he conceives to have been the means of preserving them. Now, the fact is, that the bones and mud were found *mixed together;* some of the bones being wholly covered with mud, some partially covered, and some not covered at all. So far was the mud from being the means of preserving the bones, that those which lay above it were, in most instances, the best preserved; and where a bone was found lying flat on the surface, the upper side retained its freshness and its polish; while the under side that touched the mud, was partially decomposed and rough, having lost whatever polish it may have had when deposited. This circumstance I can state, not only from my own observations, but from those of William Salmond, Esq. of York, a gentleman who spent several weeks in exploring the branches of the cavern. Among his last discoveries was the skull of a hyæna, the only skull known to have been obtained; and he found it lying on the surface of the mud, and noticed particularly, that the under side, which touched the mud, was partially decomposed and discoloured, while the exposed part was fresh and smooth. I have several specimens illustrating the same fact, among which is the well-preserved shank-bone, figured in the Geological Survey, Plate XVII. N° 4.; one side of which is smooth, and retains its natural colour; while the other, the flattest side, is rough, cracked, and discoloured.*

But the argument which Professor Buckland considers as the most decisive in favour of his hypothesis, is drawn from the discovery of what he considers as *album græcum*, the fecal remains of the hyænas. I am not without suspicion, that this substance may be nothing more than concretions of the comminuted particles of bone, which, by his own account, are very abundant in the mud, and which, in some spots where much water dropped or flowed, might possibly be washed together into small lumps or balls. But, granting that this substance is true album græcum, its presence in the cave does not prove that any hyænas ever lived there. Matter of this kind would exist in the intestines of the dead hyænas that were driven about by the waters of the Deluge; and when their carcases, by long tossing about, were parted into pieces, this substance, forming a portion of the masses of animal matter, would be as easily drifted into fissures or caves as flesh and bones. Specimens of this substance are far from being plentiful.

Some of Mr Buckland's collateral proofs appear to be the offspring of fancy, rather than the result of accurate observation. Such are his notions about the different ages of the stalactites and stalagmites in the cave; some of which he supposes to have been formed prior to the occupation of the den by hyænas, some during their residence there, and some after their destruction. He found, indeed, some stalagmites on the very floor of the cavern, and other portions spreading over the surface of the mud; but, as in some places the covering of mud was very thin, and, in others, the water, impregnated with calcareous matter, might find its way under the mud, instead of flowing on its surface, he had no right to conclude, that the one kind of stalagmite was older than the other. Even the discovery of a slender stalactitic tube lying horizontally in the osseous breccia, does not show that there was stalactite in the cavern previous to the introduction of the bones; for, during the subsidences and concussions of the strata, subsequent to the Deluge, a few slender tubes of stalactite might be shaken down from the roof, and fall among the bones.

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* This specimen, with many others alluded to, may now (1827) be seen in the Whitby Museum.

The assertion, that many of the bones bear marks of their having been gnawed by the hyænas, is also unsupported by any decisive proof. Among the many hundreds of bones from the cavern, which I have examined, I have not observed one vestige of such gnawing, nor any marks of the action of teeth, save only of the teeth of Time. In conversing with Professor Buckland on this subject, when he visited Whitby, I found, that the bones which have curvatures in their fractured edges, are those which he considers as gnawed. But the bones might split and break in curved lines, as well as in straight; and even where a fractured edge was originally straight, curved places might be produced in it, by its being repeatedly dashed against ledges of rock.

No less fanciful is the Professor's idea, that the different states of decay in which the bones were found, indicate that they belonged to a succession of generations, or were deposited at different periods. As the masses of animal matter drifted by the waters of the Deluge would contain relics of animals of all descriptions, young and old, weak and strong, sick and healthy; we could not expect, in so large a deposit, to find the whole in the same state of preservation. But the difference observed, is not so much the result of their different states at the time of their lodgment, as of their favourable or unfavourable position in the cave itself; according as they were more or less immersed in the mud, and, especially, according as they were more or less exposed to the action of water. Some of the teeth and bones were much decayed, and almost black, evidently through the effect of water; while others, occupying more favourable positions, were remarkably fresh.

It is rather strange, that Mr Buckland should draw one argument to support his theory, from the circumstance, that few of the hollow or marrow bones are unbroken, and that the most entire bones, and parts of bones, are such as are naturally most hard and solid; for this is just what we might expect, whether the bones were broken by dashing against rocks, or by hyænas' jaws. Some marrow-bones, however, are quite entire; and others that are broken cannot well be supposed to have been cracked by the hyænas, to obtain the marrow, for, as they are merely broken across, very little of the marrow could be extracted.

The great disproportion of teeth in the collection, instead of favouring the den hypothesis, is rather against it; particularly as it regards the teeth of the elephant, rhinoceros, and hippopotamus. The entrance of the cave was too strait to admit the head of one of these animals; and the pachydermata have generally such short and thick necks, that it would be no easy task for hyænas to behead their carcases. Unless the hyænas were actuated by sentiments of glory, they would be more likely to carry off their legs, than to attempt to pull their jaws to pieces, and bear off their ponderous teeth as a kind of *spolia opima.* The grinder of a large elephant, such as I have seen fragments of from the cave, would be a most unlikely morsel for a hyæna to chew; nay, it appears impossible that an elephant's grinder could be broken into such splinters by the force of a hyæna's jaws. But, on the supposition that the animal matter was drifted in, detached from some large mass or masses of animal matter, composed of the remains of animals mixed up in a state of great confusion, the disproportion of the teeth to the bones, and of the hyænas' bones to the other relics, creates no difficulty; for chance would principally determine, what quantity of animal matter, and what kind, should form any particular deposit or collection: only we might expect the heaviest matter, such as teeth, to be lodged most plentifully in the lowest situations.

The Professor displays great ingenuity in getting over some of the difficulties attending his hypothesis; yet some of them are by no means removed. To account for our not finding any entire skeletons of hyænas, he not only supposes that they fed on one another, but that they kept so good a look-out at the Deluge, that the whole colony escaped to the mountains, on the rising of the waters. But surely, if the majority of such a large tribe escaped, it is not too much to expect in the den the skeletons of some of their young, or of the very old and infirm that were unable to flee. Indeed, it seems more likely that they would take refuge in their den, than seek shelter elsewhere.

But there are other difficulties which Mr Buckland has not set aside. Some of the bones or fragments were found on the sides and near the roof of the cavern, incrusted with stalactite. How came they to be lodged there, on the Professor's hypothesis? Did the hyænas toss up bones by way of amusement; or lay them purposely on shelves of the rock? If the bones were drifted in, it is easy to account for this phenomenon; for the jerking of the water into the cavern would throw up bones and splinters on ledges of the rock, where some of them would remain, when the waters withdrew. Of the fact I am fully assured, as a gentleman belonging to Whitby knocked off with his own hands, from the upper part of the cave, a specimen of stalactite with a piece of bone imbedded in it.

A stronger objection to Professor Buckland's hypothesis, arises from the discovery of so many bones of birds, rats, mice, and other small animals. He insinuates, that some of these may have entered the cavern since the Deluge, the cave being not completely shut; for he is not sure whether the entrance was found covered by the common alluvium, or by the debris that had fallen down from the upper part of the bank. On this subject, however, I can speak with the utmost certainty, both from my own observations and those of others. The mouth of the cave, as is stated in the Geological Survey, is closed up by the same alluvial beds which cover the rest of the bank; and the undisturbed state of these beds clearly shewed, that no living creature had entered there since they were deposited. If we should suppose that rats, mice, or weasels, could enter by some small crevice or outlet, why were none of their skeletons found? Why were their bones broken, dispersed, and mixed up with those of the hyæna, the rhinoceros, and the stag? Mr Buckland himself allows many of these minute bones to be of the same antiquity with the larger bones.

In noticing this subject, the Professor has overlooked, or but slightly noticed, the grand difficulty arising from the existence of these relics in the cavern, in the state described. The main question is not, How came the hyænas to eat rats, mice, and fowls? but, How came they to tear such small creatures to pieces, break their bones, and scatter them all over the den? Supposing that the hyænas would make a prey of a mouse as well as of an elephant, and feed on a rat as greedily as on a rhinoceros, Can we imagine that they would take the trouble to convey such minute creatures into their den? Or, if we grant that a hyæna might scamper home with a couple of rats or mice in his mouth, Would a creature of such 'omnivorous appetite' have patience to dissect them, to break their bones, to gnaw them, and to suck out the marrow? Would he not rather snap them up like shrimps, at one morsel; and leave us no chance of finding any of their relics in the den, except as forming a component part of the balls of *album græcum?* The great quantity of the bones of these small animals mixed with the mud, warrants us to say, that both the mud and the bones have been introduced together.

For receiving the hypothesis which I have advanced, it is not necessary to adopt, to its full extent, the theory proposed in the Geological Survey, or, that all the secondary rocks were formed at the time of the Mosaic Deluge. It is sufficient to admit, that, while the diluvian waters covered the present strata, there were open fissures in the limestone, which were afterwards closed up by the deposition of the alluvial covering.

This hypothesis has some important advantages over the Den Theory, besides those already noticed; especially as it explains, in a great measure, all other phenomena of this kind, as well as what have been witnessed at Kirkdale. It accounts for the deposits of such animal remains in the alluvium,—and for those also which are found in rocks, in situations which no flight of fancy could transform into dens; which collections Professor Buckland himself allows to have been drifted in by water. Even the phenomena at Pallion Quarry, in the magnesian limestone, may be explained on this principle. Though there is no apparent opening there for admitting the mud and animal remains, yet the seams between the beds of limestone may have been in some spots so open, as to allow the waters of the Deluge, in small quantity, to penetrate through them, before the rock was covered with alluvium; especially as the strata might then be less compact than they are now. This water being loaded with mud and sand, mixed with animal remains, flowing backward and forward through the crevices, they were at length choaked up; the mud filling up the interstices between the beds, where we now find it. The shifting of the water through these interstices, in a horizontal direction, may serve to account for the numerous, small, rounded, and apparently water-worn, cavities in the stone, occurring at the seams; most of which cavities are filled with mud. The water might enter these horizontal seams, either at vertical cracks or clefts, or at some break in the strata, perhaps at that which formed the bed of the Wear, which flows past the front of Pallion Quarry.

The rounded holes on the floor and sides of Kirkdale Cavern indicate, that water has also flowed through it for a considerable time, and with no small violence. If a flux and reflux continued here for some time after the bones were introduced, this would serve to break and wear them rapidly. The bones, or parts of bones, that are least worn, might be protected by having portions of fleshy matter adhering to them, or might be among the last that were drifted in. I have some ends of leg-bones, or shank-bones, from the extreme parts of the cave, so rounded and worn as to resemble pebbles. I have also seen a few real pebbles from this cavern; and sand is said to have been found in some of the farthest branches. In the Manor Vale Cavern, at Kirkby Moorside, Mr Bird found both sand, gravel, and decayed vegetable matter. But even the total absence of sand and gravel from the Kirkdale Cavern, could be no valid objection to my hypothesis; for, in the bottom of the diluvian ocean, as in that of the present ocean, there might be spots where mud alone prevailed, as well as others where sand and gravel predominated.

The subject might admit of additional illustration, but I shall only notice farther, a fact, observed by Professor Buckland, viz. that the bases of the stag's horns found in the Cave at Kirkdale, appear to indicate that they have been shed from the head, and not broken off by violence; a fact which, according to the hypothesis advanced in this paper, may be deemed curious, as serving to point out the season of the year when the Mosaic Deluge commenced.*

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* Since this and the former paper (published in vol. iv.) were communicated to the Society, the author has seen good reason to exclude the *horse* from the list of the animals whose remains have been preserved in Kirkdale Cave. All the remains of this animal, extracted from the Cave, appear to have been thrown into it by some wags, or rogues, on purpose to increase the amount of the relics. The teeth of sheep and of hogs, as well as those of horses, have thus found their way into collections of Kirkdale bones. A horse tooth, selected from such spurious relics, has the honour of being figured in one of Professor Buckland's plates.

The specimen of jaw-bone with two teeth, noticed in vol. iv. p. 263, as not identified, and of which a model was presented to the Wernerian Society, appears to belong to a small hippopotamus. The grinders of that animal are usually marked with rosettes on their masticating surface, and some teeth so marked were found in the cavern; but when the surface is worn down, the grinders correspond exactly with the two teeth in that specimen.

IX.—*Observations on the Anatomy of the* Perameles nasuta, *from New Holland.*

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(*Read 26th January* 1828.)

Since that remarkable quadruped the Virginian Opossum, with an open external pouch on the fore part of its belly for the reception and maintenance of its premature young during the period of their lactation, was first observed by navigators on the coasts of the New World, naturalists have become familiar with the singular appearance and habits of many similar Marsupial animals, by their frequent occurrence in different parts of America, in the islands of the South Pacific Ocean, in New Holland, and other parts of the East; and more than fifty species of this new and remarkable order of Mammalia have now been observed and described by authors. But notwithstanding the interesting observations of Barton, Aboville, Bell, Home, Geoffroy, Blainville, and Cuvier, on the structure and economy of these animals, the distinctive characters and living habits of many of the species are still imperfectly known, the anatomy of very few has been examined with detail, and the theory of their singular mode of generation is still almost entirely conjectural. It has been long known that the young of these animals are found in a very imperfectly formed state, adhering to the points of the mammæ, which are always placed in the external pouch, and that they remain fixed by their mouth to the nipples, till they have acquired a considerable size. Marcgrave, Pison, Valentyn, Beverley, and others, supposed the external sac to be the only uterus, and that the young are generated, as well as maintained and suckled, in that cavity. Home, Barton, and Blainville, have maintained, that the fœtus in utero is not connected with the parent by a placenta, or umbilical cord; but is suspended loosely in a gelatinous matter, like the young of oviparous animals; while Geoffroy (*Ann. des Sc. Nat.* tom. ii.) more recently maintains, that the umbilical cord is distinguishable in the uterus during the embryo state of the young. Some naturalists, as Blainville and Desmarest, suppose that the young pass, in their embryo state, from the uterus directly through the parietes of the abdomen into the external sac; which M. Blainville thinks is accomplished by means of the round ligaments of the uterus (*Bull. des Sc.* 1818, p. 28), whose functions, in other mammalia, have not been satisfactorily ascertained: while others believe, that the premature young pass from the uterus into the vagina; which, by projecting in an inverted state, reaches the abdominal sac, and deposites them in that cavity, or probably even attaches them to the mammæ.

The mode of generation of marsupial animals is connected with many interesting physiological inquiries; but the opportunities of observation occur so seldom in Europe, that the entire and satisfactory solution of this obscure problem must be looked for from those who enjoy favourable opportunities in the remote colonies, particularly in

New Holland, of watching the progress of this function in different species, and of dissecting the recent animals in every stage of gestation.

Geoffroy de St Hilaire has removed much of the confusion which formerly existed in the natural history of marsupial animals, by subdividing and defining the genera, and by pointing out new and interesting anatomical relations among the species; and he has thrown much light on their physiology, by his profound and ingenious observations on the distribution of the two hypogastric arteries in these animals, and on the consequences which result from that distribution. The genus *Perameles* was instituted by him in 1804, for the reception of two rare species; one of which has been figured and described in the "Naturalist's Miscellany," and in Shaw's "General Zoology," from a specimen in the Hunterian Museum of London, under the name of *Didelphis obesula* (*P. obesula* of Geoffroy); the other was a new species, first described by him, and which he named *Perameles nasuta*, from the lengthened form of the nose. These two species are both from New Holland, and are among the most rare and least known of marsupial animals. They are termed *Perameles*, from their general resemblance to the badger, and from their possessing a distinct marsupium (from Πηρα, a pouch, and *meles*, a badger). The two species of Perameles belong to the genus Didelphis of Linnæus and Shaw, and to the Thylaces of Illiger. There is a specimen of each species preserved in the Museum of Paris; but the descriptions of their external characters are still very imperfect and contradictory, we are still entirely unacquainted with their natural habits, and the internal structure of neither species has yet been examined. In Mr Shaw's figure of the Perameles obesula, in the Naturalist's Miscellany, two toes are represented as united under the common integuments, as far as the roots of the nails, both on the hind and the fore feet. Geoffroy and Desmarest confine this peculiar formation of the toes to the hind feet alone. Desmarest, in his recent work on the Mammalia, has given five toes to the fore feet, and only four to the hind feet, in both species; while Geoffroy places five toes on all the extremities. This contradiction arises from M. Desmarest's not enumerating the rudimentary toes of the Perameles, which, however, are generally enumerated in other Mammalia.

The specimen of Perameles nasuta, from which the following observations were taken, was a full grown female, measuring twenty inches from the point of the nose to the free extremity of the tail, and contained one of its imperfectly formed young in the external abdominal pouch. It was sent entire, preserved in spirits, from New Holland, by Sir Thomas Brisbane, whose zeal in the promotion of science has greatly enriched the zoological collections of Britain, and afforded the most liberal and valuable assistance towards solving many obscure and interesting problems of physiology. As the long action of spirits loosens the fur of quadrupeds from its connection with the skin, and renders specimens so preserved unfit for stuffing, and useful only to the anatomist, Professor Jameson, to whom this specimen was sent, kindly submitted it to me for dissection, requesting me to preserve the skeleton entire for the Royal Museum of this University. Drawings of the entire animal, and of several of its parts, were taken from this specimen immediately after its arrival by Mr William Macgillivray, assistant-keeper of the Museum, and are designed to form a part of the ensuing Number of Mr James Wilson's highly interesting, popular and splendid "Illustrations of Zoology."

Although the dimensions of the specimen, submitted to my examination, were somewhat less than those of the specimen preserved at Paris, and described by Desmarest, it was obvious, from the state of the uterus and mammæ, and the existence of one of the young in the marsupium, as well as from the general appearance of the other parts of the body, that it had already arrived at maturity. The dimensions of the specimen measured by Desmarest were the following:—

	Inches.	Lines.
Total length of the body measured from the point of the lips to the base of the tail,	1	4
Length of the head,	0	4
——— tail,	0	6
——— anterior extremity,	0	3
——— posterior ditto,	0	6

The external dimensions of my specimen were as follows:—

	Inches.	Lines.
From the point of the nose to the occipital protuberance,	4	5
From the occipital protuberance to the anus,	10	0
Length of the tail, measured from the anus,	6	0
Length of the ears,	1	5
Breadth of the ears at their base,	1	2
Circumference of the head above the eyes,	5	0
Circumference of the neck behind the ears,	6	0
Circumference of the thorax immediately behind the fore legs,	8	0
Length of the fore legs, from the head of the humerus to the point of the longest claw,	4	3
Circumference of the abdomen immediately before the hind legs,	8	5
Length of the hind legs, from the head of the femur to the point of the longest claw,	6	3
Length of the longest claw on the fore feet,	0	6
Length of the longest claw on the hind feet,	0	4

The animal resembles a large brown rat, in having straight, stiff, dark brown hair; a low stature; a lengthened form of the trunk, which is nearly of equal thickness in the thorax and abdomen; a tapering, long, conical head; large and nearly naked, membranous ears; a long, thin, and regularly tapering tail. The *hair* on the upper parts of the head and body, and on the tail and legs, is of a dark, reddish-brown colour, which gradually passes into greyish white on the lower parts of the head, neck, chest, and belly. The fur is pretty compact, and lies flat, presenting a smooth, glossy surface; it consists of dark coloured bristly straight hairs, about an inch in length, and a softer short white woolly hair. The long straight hairs have a singular broad and compressed form in their middle, and taper towards both extremities; they are of a greyish colour at the roots, and become nearly black at their broad parts and free extremities; there are whiskers, consisting of several long straight, dark bristles on the upper lip, immediately above each canine tooth; and similar tufts of long bristles on the cheeks between the angle of the mouth and the eye. M. Desmarest likewise remarked, that the hairs were of a grey colour at their roots, and yellow or black at the points; "whence," he says, "there results a general light brown tinge, which has a close resemblance to that of the field-mouse." Daubenton observed the contrary in the hair of the Opossum, where they were of a shining grey colour at their free extremities. The *nose* projects half an inch beyond the extremity of the lower jaw; it is naked above for the space of three quarters of an inch from the point, and the prominent part is soft and cartilaginous for more than a quarter of an inch beyond the protuberance of the upper jaw-bone. The external openings of the nostrils have a curved form, with their convexity directed downwards and backwards, produced by a semicircular lobe projecting from the septum over each nostril, and they are thereby removed considerably from each other, as in the Opossum. The *tongue* is very long, flat, narrow, rather thin, of equal breadth from its root to near its extremity, which has an elliptical form; it measures three inches from the root to the apex, and is quite free for nearly two inches from the frenum. This freedom of motion of the tongue corresponds with the wide gap of the mouth, and the lengthened form of the jaws, and may indicate the aid required from this organ in seizing or collecting food. The *ears* are long, broad, elliptical at their apex, thin, soft, and scantily covered with small, dark, very short hairs. The *eyes* are rather small; their position lateral, and inclined a little upwards and forwards. The *membrana nictitans* is large and strong, and can be drawn more than half-way over the cornea. The margins of the eye-lids and the surrounding hairs are of a black colour. There are no distinct cilia, nor caruncula lachrymalis, but in the situation of the latter there is a thickened fold of the tunica conjunctiva. The anterior canthus of the eye is very acute, and prolonged forward; the posterior canthus is rounded, and nearly imperceptible, which gives to the eye a peculiar expression of cunning. The *neck* is short, thick, round, and scarcely distinguishable from the head. The *body* is nearly cylindrical, slightly compressed, equal; becoming only a few lines thicker in the region of the loins. The *fore-legs* are two inches shorter than the hind pair, of a tapering form, susceptible of free supination and pronation, the radius and ulna being separate and moveable. The flexor muscles of the humerus are remarkably strong, which, with the form and length of the claws, might lead one to suppose that the animal occasionally sought its food by scraping or digging the ground. Length of the humerus 1½ inch; ulna (from the point of the olacranon), 2 inches. Length of the fore-foot, from the carpal joint to the point of the middle claw, 1¾ inch. The joints of the metacarpus and toes admit of very free motion. The lower surface of the fore-foot naked to the carpal joint, concave, and covered with a soft white cuticle. From the flexibility and extent of motion of the toes, the fore foot can grasp and surround objects smaller than a pea, and only the wrists and points of the claws appear capable of resting on the ground in walking,—a structure which would better adapt the animal for climbing on trees than walking on a flat surface. There are five toes on each of the four feet. The outer and inner toes are only rudimentary, without nails, naked, two lines long, extending only half an inch from the carpal joint to their free extremities, and are nearly opposed in their position to the other three toes, which chiefly form the foot. The three middle toes are long, slender, and quite free to the metacarpal bones. The second toe, or indicator, measures 10 lines; the middle toe, or pudicus, 11 lines; and the fourth toe, or annularis, 7 lines from the metacarpal bone to the point of the claw. The *claws* are long, slender, slightly curved, compressed laterally, flat on their lower concave surface, arched acutely above, round and depressed at their points; they form sheaths over the last phalanges or ungual bones, which extend a considerable way into them. They are of a delicate, translucent, horny texture, of a yellowish or amber colour; and, from the fineness and sharpness of the points, they appear to have been very little used in scraping or digging the ground, if ever employed for that purpose. Geoffroy, however, conceives, from the structure of the claws, that both species of Perameles are peculiarly formed for burrowing in the earth. The claw of the second toe is 5 lines long; that of the middle toe, 6 lines; and that of the fourth toe, 3 lines. The *hind legs* are very thick, and muscular as far as the ancles, or tarsal joints, and of nearly twice the length of the fore legs. The femur is $2\frac{1}{2}$ inches long; the tibia, $2\frac{3}{4}$ inches; and the foot, from the tarsal joint to the point of the longest claw, $2\frac{3}{4}$ inches. The hip-joint admits of little flexion and extension, but of so great abduction, that the two thighs can be separated from each other to a straight line, which must allow the freest access of the young to the abdominal pouch placed between them. The hind feet have a very lengthened form, like those of the Kangaroo, and have *five* toes like the fore feet (not *four*, as stated by Desmarest) but of a very different structure. The inner or first toe is only rudimentary, naked, about two lines long, without nail, and of an obtuse conical form. It is placed midway between the two extremities of the foot, on its under surface, and is opposed to the other toes. The second and third toes are small, short, and bound together under the skin like a single toe, as far as the roots of the claws, which are quite free and moveable. The fourth toe is the longest, and by much the largest on the hind foot. It extends eight lines beyond the united toes just mentioned, and half an inch beyond the outer or fifth toe, which is the second largest on the foot. The claws of the hind feet are shorter and thicker than those of the fore feet, and are nearly straight. The longest toe on the hind foot measures $1\frac{1}{4}$ inch from the metatarsal bone to the point of the claw. The pelvis is very long and narrow, and is prolonged backwards towards the root of the tail, considerably beyond the head of the thigh-bones; which gives a conical and somewhat angular form to the posterior part of the trunk. The *tail* is long, slender, conical, very flexible, and covered to its point with short, dark, straight hair, which is shortest and most scanty on the lower surface. Beneath the hair the epidermis of the tail is rough, and covered with regular transverse markings, like scales: between which the hairs shoot up, as has been observed in some other quadrupeds.

The most remarkable external character of this animal is the *marsupium*, or abdominal pouch, for the reception of the premature young, and for the lodgment of the mammæ. This sac does not open from above downwards in the Perameles, as it does in most other marsupial animals; but commences almost imperceptibly at a short distance from the anus, about half an inch from the orifice of the vagina, and extends upwards, under a thick fold of the skin, to the point of the sternum. This remarkable form of the sac, which appears not to have been noticed in other marsupial animals, greatly favours the opinion of those who have conceived that the young are deposited in the sac by the protruded vagina. The entrance of this inverted sac is arched upwards, and is quite open for more than an inch from its lower, or anal, margin. The whole cavity is lined with soft, short, white, woolly hair, and its parietes are remarkably soft and dilatable. The two supplementary or marsupial bones, 11 lines in length, about 1 in breadth, and not half a line thick, are connected, as usual, with the recti and pyramidal muscles of the abdomen, and have no immediate connexion with the fold of integuments which forms the marsupium. The number of mammæ varies considerably in marsupial animals. There are eight *nipples* in the pouch of the Perameles, placed in two longitudinal rows; the upper and lower pairs of which are closer together than the middle pair; the two upper nipples of the left row, and the second upper one on the right side, were more than double the size of the rest, which would lead us to infer that there were three young in the sac when the animal was taken, as the nipple enlarges during lactation, as well as the fœtus which clings to it. The nipples had the usual conical form, and round, smooth apex, imperforated in the centre. The three largest nipples measured 3½ lines in length, and 1 line in breadth at their base. On pressing the mammary glands, which are two in number, and extend along the back of the two rows of nipples, a thin yellowish fluid was seen to issue from six or seven small orifices of excretory ducts, opening round the apex of each nipple, as in other quadrupeds. These minute orifices around the extremities of the nipples were very distinctly seen with a lens, and in the largest nipples they appeared open tubes; but there was no orifice of any kind in the smooth centre of the nipple, to indicate any previous organic connection with the fœtus.

When I received the specimen for examination, there was one fœtus in a very imperfectly formed state, lying loose in the sac. It measured only 11 lines from the mouth to the anus; its surface had a smooth, white colour, and had no hairs on any part. The head and chest were the parts of the body most developed, as in the fœtus of other quadrupeds; the head was more than a third of the size of the whole fœtus. The eyes were proportionally large; and the eyelids were closed on both eyes. On opening the eyelids, a white opaque surface presented itself, through which neither pupil nor cornea could be distinguished. The ears were distinguishable, though very small and membranous. Both jaws were of the same length, and very broad and short. The mouth was open, and presented no appearance of any previous organic connexion with the nipples of the mother. The surface of the belly was quite smooth, and slightly carinated in the region of the umbilicus, but no trace of umbilical cord, or other means of connexion with the parent, could be discovered with the assistance of a lens. On the lower part of the abdomen there were two distinct lateral folds of the skin, forming an imperfect abdominal pouch, opening below like that of the mother. This organ has been found also in the males of some other genera; and Daubenton observed the pouch on the young female Opossums still within the marsupium of the mother. Projecting from the fore part of the anus, was seen a slender white penis, about a line in length, and bifurcated at its extremity, like the glans penis of some other marsupial animals. The tail was a line and a half in length, and like a fine thread. The head, trunk, and extremities were quite soft and flexible, no bones being yet formed in the body. The claws were scarcely perceptible on the points of the toes, which appeared like buds on the extremities.

The *teeth*, which vary more in marsupial animals than in any other Order of quadrupeds, present important characters for the distinction of the species, and help to point out the kind of food on which they naturally subsist. Those of the Perameles nasuta are correctly stated by Geoffroy to be, Incis. $\frac{10}{6}$; Can. $\frac{2}{2}$; Mol. $\frac{7}{7}$–$\frac{7}{7}$; but he has represented them rather larger than natural, particularly the canine teeth, in his figure of this animal (*Ann. du Mus.* tom. iv. pl. 44.) On each side of the *upper jaw* there are five small sharp incisors; one curved, pointed, canine tooth; and seven grinders. The first four of these incisors are in close contact with each other, and scarcely project half a line from their sockets. The fifth incisor, likewise inserted into the intermaxillary, or incisor bone, is two lines distant from the fourth incisor, and at the same distance from the canine tooth. The canine tooth is double the length of the incisors, projects a line beyond its socket, has a sharp, compressed, conical form, slightly curved backwards, and is also separated by an empty space of two lines from the first grinder. The first three grinders are compressed like the canine tooth, have a single longitudinal row of three sharp tubercles, the middle tubercle of each tooth being more than double the length of the two lateral points. The first of these grinders is a line and a half distant from the second; the second is half a line distant from the third; and the base of the third is nearly in contact with the fourth grinder. The four posterior grinders have very broad, and nearly square crowns; they are in close contact with each other, and have each a double row of sharp conical points; the outer and inner rows being separated from each other by a deep longitudinal groove; the outer row consists of three sharp and elevated points, and the inner row of two larger tubercles. On each side of the *lower jaw* there are three very sharp incisors, projecting more than a line from their alveoli, and much inclined outwards; one conical, curved, compressed, canine tooth; and seven molares, the first three of which are compressed, and have a single row of cutting points, and the four posterior have square crowns and a double row of tubercles, as in the molares of the upper jaw. The third incisor from the front of the lower jaw is a double tooth, the part above the socket appearing like two small incisors united on the same neck, and is nearly three lines distant from the canine tooth. The canine tooth is rather smaller and more obtuse than that of the upper jaw, and is more than two lines distant from the first molares. The first three molares are shaped like those of the upper jaw, with a long, middle, compressed, cutting tubercle, and a smaller cutting point before and behind. The first molaris is a line distant from the second, the base of the second is nearly in contact with the third, and the base of the third is close to the fourth grinder. The four posterior grinders are in close contact, and have two rows of tubercles separated by a longitudinal groove; but, contrary to what takes place in the upper jaw, the outer row consists only of two large tubercles, and the inner row of three sharp points. The teeth of the lower jaw are, in general, larger, and project more from their sockets than those of the upper. They are placed alternately with regard to those of the upper jaw, so that, in closing the mouth, the teeth of one jaw fall into the empty spaces and hollows of the other jaw; and the whole teeth of the lower jaw fall a little within those of the upper jaw. The space occupied by the teeth on both jaws, from the front incisor to the posterior grinder, is about one inch and eight lines.

The upper surface of the *tongue* is covered with close and extremely minute papillæ; other papillæ are seen of a larger size, placed at distances of nearly a line from each other, and appear like the ends of small bristles distributed over the whole tongue, and raised about the third of a line above its surface. On the upper surface of the roof of the tongue there are three large papillæ, placed in a triangular form, on the surface of which are perceived the orifices of minute ducts. Each of these large papillæ is enclosed in a distinct circular sheath, and the root of the tongue is fimbriated on the sides at the place where these large papillæ are situate. These three glandular papillæ have the same form and arrangement on the tongue of the Opossum. On the upper surface of the tongue there is a very slight longitudinal groove running along the whole mesial line. On its lower surface there is a corresponding small ridge running in the same direction, and extending from the point to the frænum. There is a small fold of the skin on each side of the mesial ridge on the lower surface, which is raised about a line from the surface, and extends in the same direction, from the apex to the frænum. Below the tongue, on the floor of the mouth, there are likewise two longitudinal folds, corresponding in size and position with those on the lower surface of the tongue, and having a small longitudinal groove in the middle between them.

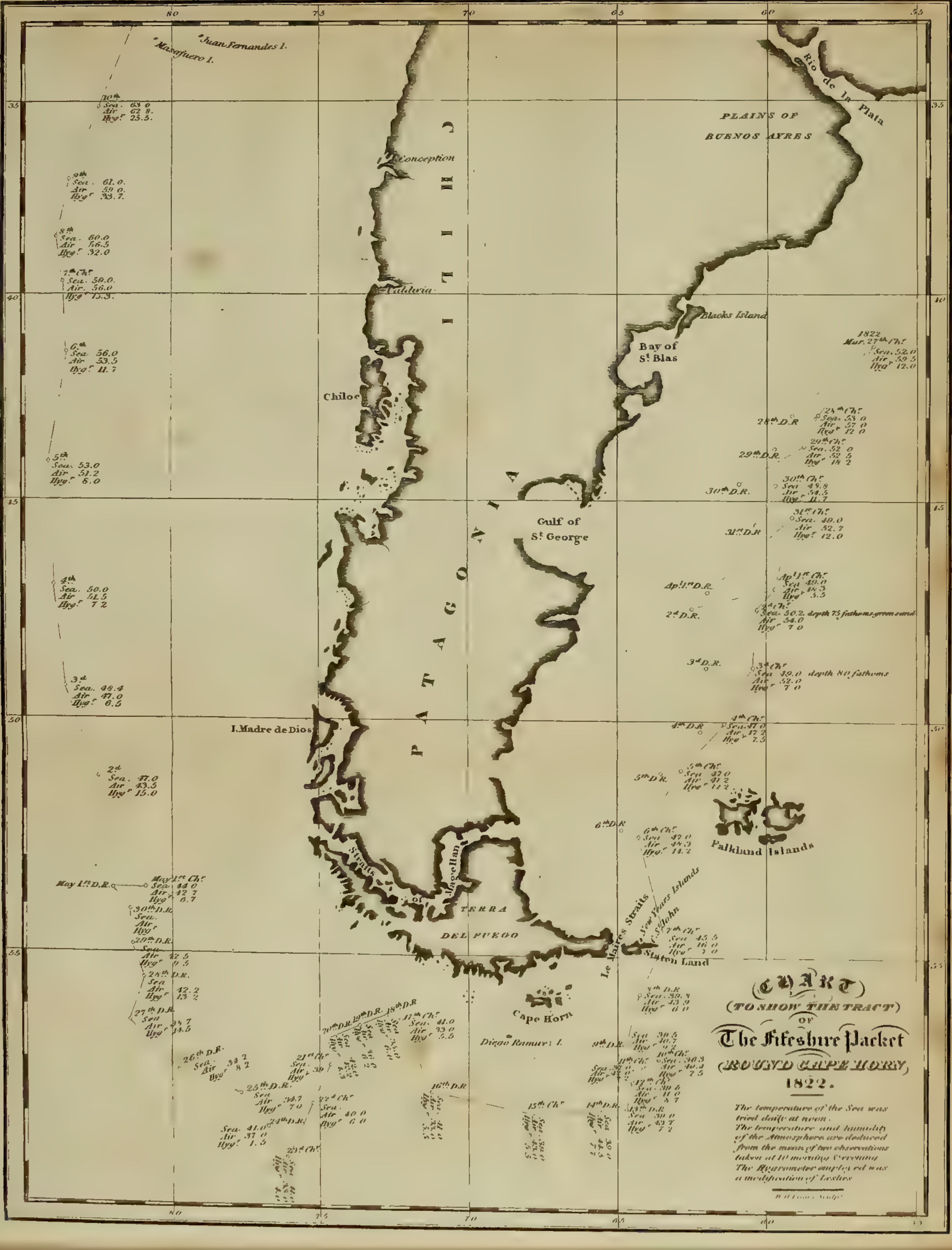
The roof of the palate is covered with a black cuticle, and is marked with about fourteen elevated transverse ridges, slightly curved forwards, and formed by folds of the membrane lining the mouth. The roughness produced by these elevated ridges must greatly assist the tongue in retaining small moving objects, like insects, endeavouring to escape from the mouth, and in extracting the soft nutritious parts from their horny coverings; and it will be shewn hereafter that this is the kind of food on which the Perameles subsists. These folds are likewise found in the Opossum, but in smaller number. The fauces were narrow; the epiglottis broad and short, as in the Opossum, but with a groove on its free margin, corresponding with the posterior end of the rima of the glottis; the cartilaginous rings of the trachea were very soft and thin, and formed complete circles, divided only by a fissure on their posterior side; in this respect the trachea has some resemblance to that of birds, where the rings are generally complete. The right lung was rather larger than the left, from the heart lying a little to the left side; it was divided by two deep transverse fissures into three lobes, the superior of which was the smallest, and its form was adapted to that of the upper narrow part of the thorax; the middle division of the right lung formed a long, curved, tapering lobe, extending horizontally forward under the apex of the heart, which, in this animal, is placed rather high in the thorax. The inferior lobe was as large as both the preceding, of a triangular form, with its apex pointed downwards. There was likewise a small divided appendix to this lung, placed on the right side of the mediastinum, and lying behind the apex of the heart. The left lung consisted of one undivided lobe, the dorsal margin of which is broad and round; this lung tapers gradually to its sternal margin, which is very thin and semicircular. Daubenton likewise found three lobes on the right side, and two on the left, in the lungs of the Opossum.

The *œsophagus* measured 4½ inches from the root of the tongue to the cardiac orifice of the stomach. It was about three lines in diameter when moderately inflated, and consisted of pretty strong coats. The internal surface had a red and villous appearance, and was strongly marked with longitudinal striæ of muscular fibres to near the cardia, where it became much thinner, smooth internally, and dilated at its entrance into the stomach. The stomach was comparatively small, largely provided with glands, and with a thick muscular coat. It had a singular, round, ovate form, measuring scarcely 2 inches from right to left, and about 1½ inch from above downwards, when moderately inflated. The œsophagus entered near the middle of its upper margin, leaving a large hemispherical shut portion or cul-de-sac, on the left side, the internal surface of which was quite smooth and villous; while the right half of the stomach was entirely covered internally with rugæ, running chiefly in a longitudinal direction, and particularly numerous towards the pylorus. The circular fibres forming the sphincters were very distinct, both around the cardiac and pyloric orifices of the stomach. Its cavity contained no food, but a few hairs and some vegetable fibres, like fragments of straw or grass, still remained in it. Immediately beyond the sphincter of the pylorus there is a contracted ring around the commencement of the duodenum, in which small twigs from the hepatic and gastric arteries pass round both sides of the intestine.

From the pyloric extremity of the stomach to the caput cæcum coli, measured 29 inches; from the cæcum to the anus, 9 inches; and the cæcum itself was 3 inches long. The coats of the duodenum and jejunum were very thin and delicate; those of the ilium were thicker, and they were strongest in the cæcum and colon. The ducts from the liver and pancreas entered the duodenum at the distance of one inch from the pylorus. The duodenum was the widest portion of the small intestine, and measured 5 lines in diameter; the jejunum and ilium were scarcely 4 lines in breadth. No food was found in the duodenum or jejunum, but the ilium contained a considerable quantity of a soft chyme, mixed with fine sand, and very minute fibres. In the upper part of the ilium this chyme had a yellow colour; but in the lower ten inches, the coats of which were thickened and black, the chyme was of a black colour, and more consistent. The whole internal surface of the small intestine was smooth and uniform, without any apparent villi. The black and thickened appearance of the lower portion of the ilium seemed to be the result of a wound received during the life of the animal, as there was an incised wound half an inch long through the coats of the intestine at the upper end of the blackened portion. The parietes of the abdomen had very properly been opened to allow the spirits to act on the viscera, when the specimen was about to be sent from New Holland. The orifice of the cæcum was large, and was only protected by a thickened margin acting as a valve. The cæcum resembled that of the Opossum; it was short, smooth, and uniform on its surface, without internal plicæ, or external longitudinal bands; it became gradually larger from its valvular orifice to its shut end, and was bound throughout its whole length to the outer surface of the intestinum ilium by a distinct meso-cæcum. Its internal surface was strongly marked with longitudinal striæ of muscular fibres, and its cavity was filled with the same kind of black feculent matter which filled the colon and rectum. The colon and rectum had no internal plicæ, nor external longitudinal muscular bands; their coats were smooth and uniform, and had no perceptible villi. This portion of the intestine was about an inch in diameter, had a distinct meso-colon to near the anus, and was supplied with numerous branches of the mesenteric artery, which, in this animal, was single, as in other marsupial animals. In order to discover the kind of food which had been last taken by the Perameles, I collected the feculent matter from the whole of the large intestine. It had a black and granular appearance, mixed with some hair, vegetable fibres, and an immense number of black, shining scales. It was of a thick consistence, and was not divided into portions, as it is generally in animals which have plicæ in their colon. On mixing a portion of it in water, the whole surface of the water became instantly covered with the black shining scales, which rose by their specific lightness to the surface of the fluid. The bottom of the vessel I found to be covered with a thick layer of very fine sand, of a light grey colour, together with some tufts of fine woolly hair, and some flat vegetable fibres, like partially digested straw. The black floating scales, when examined through a lens, appeared obviously to be the *elytra*, or outer horny coverings of the wings, of beetles, and other coleopterous insects; and, on examining with more care, I collected *elytra*, abdominal rings, entire legs and wings of coleopterous, neuropterous, and other orders of insects. Some very small insects, apparently young ants, had likewise passed thus far through the intestinal canal, without suffering much injury to their external form, although their soft substance had been extracted from their interior. The greater part of the feculent matter was distinctly composed of the horny and indigestible parts of insects, and probably the fine hair with which they were mixed, belonged to the same animals either in their larva or perfect state. The fine sand and vegetable fibres may have been taken accidentally along with these creeping objects. The examination of the fæces proved satisfactory with regard to the insectivorous nature of the Perameles, which I had been led, along with others, to suspect, from the sharp pointed tubercles of the molar teeth, the freedom and length of the tongue, and the long slender form of the claws.

PLATE III.

Wern. Mem. Vol. 4. p. 203



(CHART)
(TO SHOW THE TRACT)
OF
The Fifeshire Packet
(ROUND CAPE HORN)
1822.

The temperature of the Sea was tried daily at noon.
The temperature and humidity of the Atmosphere are deduced from the mean of two observations taken at 10 morning & evening
The Hygrometer employed was a modification of Leslies

W. H. Lizars Sculpt

IX.—*Meteorological Journal, from the Mouth of the Rio de la Plata to the Coast of Chili,* 1822; *with a Chart.*

By William Jameson, Esq. Surgeon.

(*Read* 13*th December* 1823.)

Dear Sir, Lima, 5*th August*, 1822.

I have enclosed a MS. chart of our track round Cape Horn. (See annexed Engraving.) The longitude, which is marked for noon, was generally determined with accuracy by means of three excellent chronometers entrusted to my care, and I have also marked the longitude, as estimated by dead reckoning, where there was any considerable deviation. In laying down the track, you will perceive I have adopted the method recommended by Captain Hall.

In the passage round Cape Horn, the vicissitudes from heat to cold, and again from cold to heat, are very remarkable. At Rio de Janeiro, in February and March, the thermometer usually stands at 80° or 85°. In three weeks we reached the parallel of the Cape in Lat. 56° S., where, with frequent storms of hail, snow and sleet, we have the temperature of the air reduced to the freezing point. Having doubled the Cape, we make a direct northerly course, and in another fortnight we again enter a tropical climate. The change of temperature in the sea-water is no less remarkable.

I have the honour to be, &c.

William Jameson.

To R. Jameson, Esq.
President of the Wernerian Society.

Date.	Thermometer,			Hygrometer,			Temp. at Sea, at noon.	Lat. S. at noon.	Long. W. at noon.	Winds.
1822.	10 morn.	10 even.	Daily range	10 morn.	10 even.	Daily range				
March										
20	76.5	73.0	3.5	36.0	35.0	.5	74.0	35° 23′	51° 20′	NE.
21	72.0	68.5	3.5	28.0	17.0	11.0	74.0	35 38	52 32	SSE.
22	81.5	71.0	10.5	23.9	16.5	7.4	74.0	36 18	53 10	WNW.
23	69.0	68.5	.5	20.0	17.5	2.5	75.0	36 38	53 20	Calm.
24	78.0	69.0	9.0	36.5	11.5	25.0	75.0	37 8	53 20	ENE.
25	70.0	67.5	2.5	17.0	8.0	9.0		38 42	53 57	W.
26	62.0	56.0	6.0	10.0	3.0	7.0		39 20	54 13	NW.
27	61.0	58.0	3.0	15.5	8.5	7.0	52.0	41 10	56 17	
28	59.0	55.0	4.0	14.5	9.5	5.0	53.0	42 45	58 20	WNW.
29	52.5	52.5	0.0	17.0	19.5	2.5	52.0	43 35	58 50	Do.
30	58.0	51.0	7.0	18.0	5.5	12.5	48.8	44 31	60 51	W.
31	54.5	51.0	3.5	20.5	4.5	16.0	49.0	45 21	59 18	NE.
April										
1	48.7	48.0	.7	5.5	5.5	0.0	49.0	46 20	61 52	SE.
2	54.0	54.0	0.0	5.5	8.5	3.0	50.2	47 21	62 25	S. to NNW.
3	53.8	50.5	3.3	10.0	4.0	6.0	49.0	48 50	62 1	NW. Hazy.
4	55.5	50.0	5.5	9.0	6.0	3.0	48.0	49 57	62 47	N.
5	49.5	45.0	4.5	7.0	5.5	1.5	47.0	51 8	62 49	ESE.
6	49.7	47.0	2.7	20.0	8.5	11.5	47.0	52 25	64 29	NE.
7	47.0	45.0	2.0	8.5	5.5	3.0	45.5	54 46	63 26	S.
8	44.8	43.0	1.8	7.0	5.0	2.0	39.8	55 44	64 20	W.
9	41.5	40.0	1.5	7.5	11.0	3.5	39.5	56 54	65 45	SW. Squally.
10	40.8	40.0	.8	3.0	2.0	1.0	36.3	56 57	63 30	WSW.
11	43.0	41.0	2.0	2.0	2.5	0.5	37.0	56 59	64 13	WNW.
12	42.0	40.0	2.0	7.5	10.0	2.5	39.5	57 26	64 31	Do.
13	44.5	42.0	2.5	9.0	5.5	3.5	39.0	57 57	64 43	Calm.
14	46.0	43.0	3.0	11.0	4.5	5.5	39.0	58 00	65 41	W. by N.
15	44.0	42.0	2.0	8.0	3.0	5.0	39.0	58 36	67 57	Calm.
16	33.0			5.5			41.0	57 40	71 21	SSE. to SW.
17	33.0			5.5			41.0	56 24	72 46	S. by W. Squally
18	35.0			6.0				56 21	72 53	WSW.
19	38.0	35.0	3.0	7.0	5.5	1.5		56 28	73 55	N.
20	44.5	40.0	4.5	5.6	3.0		42.0	56 41	74 57	WNW.
21	39.0							57 2	75 45	W.
22	40.0	37.0	3.0	6.0	5.5			57 54	75 8	WNW.
23	33.0			4.0			41.0	58 52	76 21	WSW.
24	38.0	36.0	2.0	3.0	0.0		41.0	58 21	76 41	Calm. NE. by E.
25	36.0	33.5	3.5	40.0	4.0			57 30	77 43	W.
26	35.5	33.0	2.5	11.0	5·5			57 22	79 53	SE. by E.
27	40.5	37.0	3.5	19.0	10.0			56 19	81 30	W.
28	43.0	41.5	1.5	14.0	12.5			55 25	80 56	SSW. Squally.
29	43.0	42.0	1.0	10.0	9.0			54 53	81 18	W. by S. Squally
30								54 14	81 23	SW.

Date.	Thermometer,			Temp. at Sea,	Hygrom.		Lat. S.	Long. W.	Winds.
1822.	10 morn.	10 even.	Daily range	at noon.	10 morn.	10 even.	at noon.	at noon.	
May 1	43.0	42.5	.5	44.0	7.5	6.0	53° 53′	80° 57′	NW. Calm.
2	43.0	44.0	1.0	46.0	19.0	11.0	51 31	82 30	SE. Fresh.
3	46.0	48.0	2.0	48.4	9.5	3.5	49 15	83 32	SW. Rain.
4	51.0	52.0	1.0	50.0	6.0	8.5	46 56	83 55	SW. Cloudy.
5	52.0	50.5	1.5	53.0	12.0	.0	44 11	84 3	S. Cloudy.
6	53.0	54.0	1.0	56.0	7.0	16.5	41 27	83 12	S. with rain.
7	56.0	56.0	0.0	59.0	14.0	16.5	39 43	83 23	SSE.
8	57.0	56.0	1.0	60.0	33.0	31.0	38 34	83 34	WNW.
9	58.0	60.0	2.0	61.0	34.0	33.5	37 1	83 17	Do.
10	63.0	62.5	0.5	63.0	32.0	19.0	35 11	83 16	Do.
11	63.0	63.0	0.0	65.0	11.0	16.5	33 16		
12	63.0	63.8	0.8	65.0	16.0	15.0	32 4	78 54	SE.
13	63.0	61.5	1.5	64.5	19.0	17.0	30 42	78 18	Do.
14	64.0	61.8	2.2	65.5	29.5	15.0	29 32	77 18	Do. very light.
15	63.0	61.0	2.0	64.7	28.5	28.0	28 22	76 4	Variable.
16	65.8	64.0	1.8	63.7	32.0	27.0	27 53	75 35	SSW.
17	64.5	64.0	0.5	64.0	23.5	22.0	26 53	74 27	ESE.
18	64.0	64.0	0.0	66.5	20.5	16.5	24 47	73 36	Do.
19							23 25		The coast of Chili in sight.

Account of the State of the Thermometer, and of Leslie's Hygrometer, observed at the Ports of Callao and Pisco, during the months of February, March, April, May, and June, 1823.

PISCO—Lat. 13° 40′ S. Long. 76° 10′ W.

February 1823.

	THERMOM.		HYGROM.
Mean of 10 A. M.	69°.59	......	14°.46
10 P. M.	68 .51	......	11 .97
Mean of 10 and 10, ...	69 .05	......	13 .21
Maximum, Feb. 27. ...	75 .0	27th,	37 .0
Minimum, Feb. 14. ...	65 .6	18th,	4 .5

CALLAO—Lat. 12° 2′ S. Long. 76° 58′ W.

March 1823.

	THERMOM.		HYGROM.
Mean of 10 A. M.	69°.94	......	14°.32
10 P. M.	67 .36	......	7 .53
10 and 10, ...	68 .65	......	10 .92
Maximum, 15th, 16th, 19th, ...	73 .0	15th, 16th,	23 .5
Minimum, 9th, ...	65 .8	16th,...	1 .5 at 10 P. M.

April 1823.

	THERMOM.		HYGROM.
Mean of 10 A. M.	69°.31	......	15°.81
10 P. M.	66 .20	......	8 .22
10 and 10, ...	67 .75	......	12 .01
Maximum, 26th, ...	73 .0	26th,	23 .0
Minimum, 9th, ...	61 .3	5th, 18th,	4 .0

Date.	THERMOM.		HYGROM.		REMARKS.
1823.	10 morn.	10 even.	10 morn.	10 even.	
May 1	67.5	65.5	22.0	10.5	Clear. Wind SSE. Evening clear.
2	66.8	64.7	18.0	12.0	Do. do. Evening very clear.
3	69.5	64.8	24.0	8.5	Rather cloudy. Wind SE. Even. clear & calm.
4	66.5	65.0	16.0	11.0	Clear. Wind NNW. Even. very clear & calm.
5	67.4	65.4	16.0	10.0	Clear. Wind S. Evening cloudy and calm.
6	67.0	64.8	21.0	7.0	Calm and clear; evening cloudy.
7	67.0	65.6	9.5	7.5	Clear. Wind S. Evening a little cloudy.
8	66.7	65.5	12.5	6.5	Clear. Wind SSE. Evening clear.
9	65.9	65.0	13.5	9.0	Clear. Wind NNW. Even. clear. Wind SSE.
10	68.0	64.3	20.0	8.0	Cloudy. Wind SSE. Evening clear.
11	66.0	64.7	13.5	9.0	Clear. Wind S. Evening very clear & calm.
12	65.8	63.9	13.5	7.5	Clear. Wind SSE. Evening very clear.
13	66.4	64.5	14.0	11.0	Clear. Wind SSE. Evening rather cloudy.
14	67.5	65.3	15.0	9.5	Clear & nearly calm. Even. clear. Wind SSE.
15	66.2	64.6	17.0	6.0	Clear. Wind SSE. Evening very clear.
16	64.4	...	4.0	....	Hazy. Wind SSE.
17	...	60.6	...	6.5	Evening clear and calm.
18	65.5	58.7	15.5	6.5	Cloudy. Wind NNW. Even. clear & calm.
19	66.0	62.7	14.5	8.0	Clear. Wind NNW. Even. clear. Wind SSE.
20	65.4	62.9	14.5	7.0	Cloudy. Wind S. Evening clear.
21	65.4	62.2	20.0	10.5	Clear. Wind SSE. Evening clear.
22	67.0	60.0	27.0	10.0	Clear. Wind SSE. Evening clear and calm.
23	62.9	62.6	11.5	11.0	Cloudy. Wind SSE. Evening clear.
24	63.0	62.2	12.5	7.5	Clear. Wind SSE. Evening clear.
25	67.3	63.4	18.0	5.5	Clear. Wind SSE. Evening clear.
26	64.8	61.4	11.5	10.0	Cloudy. Wind SSE. Evening clear and calm.
27	67.1	62.6	19.0	8.5	Clear. Wind SSE. Evening clear.
28	65.8	62.0	17.0	9.0	Clear. Wind SSE. Evening very clear.
29	65.7	61.5	18.0	6.5	Cloudy. Wind SSE. Evening cloudy and calm.
30	66.2	62.7	15.0	13.0	Cloudy. Wind NNW. Steady breeze all day, wind from the same quarter. Evening wind still NNW.; steady breeze.
31	66.3	60.3	11.0	11.0	Cloudy. Wind NNW. Steady breeze all day, wind NNW. Evening clear and calm.

	THERMOM.		HYGROM.
Mean of 10 A. M. ……	66.23	……	15.83
10 P. M. ……	63.31	……	8.78
10 and 10, …	64.77	……	12.30
Maximum, 3d, ……	69.5	22d,	27.0
Minimum, 18th, ……	58.7	25th,	5.5

Date.	THERMOM.		HYGROM.		REMARKS.
1823.	10 morn.	10 even.	10 morn.	10 even.	
June 1	68.2	62.5	32.0	6.0	Clear. Wind SSE. Even. clear; light breeze.
2	66.5	63.7	11.0	11.0	Clear, and almost calm. Evening cloudy. Wind SSE.
3	65.6	62.7	18.5	15.5	Cloudy. Wind SSE. Even. very clear & calm.
4	66.4	62.4	20.0	10.0	Cloudy and calm. Even. cloudy. Wind SSE.
5	64.6	63.4	16.0	12.0	Cloudy. Wind SSE. Evening cloudy.
6	62.2	63.0	6.5	14.5	Cloudy. Wind NNW. Evening cloudy & calm.
7	66.3	60.3	31.5	11.5	Clear. Wind SSE. Even. very clear & calm.
8	67.6	63.6	29.0	17.5	Cloudy. Wind SE. Evening cloudy and calm.
9	67.5	58.0	34.0	6.5	Cloudy & nearly calm. Ev. very clear & calm.
10	65.7	62.3	22.5	11.0	Clear. Wind SSE. Evening clear.
11	66.4	63.7	14.5	11.5	Cloudy. Wind NNW. Midday clear. Ev. cloudy.
12	65.6	64.3	17.0	16.0	Cloudy. Wind SSE. Evening cloudy.
13	65.5	63.0	17.0	13.0	Clear. Wind NW. Even. cloudy. Wind SSE.
14	65.3	63.8	15.5	13.0	Cloudy. Wind NNW. Evening cloudy. Wind SSE.
15	63.2	64.0	8.0	10.5	Cloudy. Wind NNW. with very light rain. Evening cloudy.
16	64.5	63.0	10.5	5.5	Cloudy. Wind NW. Evening cloudy. Wind SSE. with rain.
17	65.7	63.0	24.5	9.0	Cloudy. Wind SSE. Even. calm and cloudy.
18	64.4	62.6	16.0	7.5	Cloudy. Wind NNW. Evening cloudy. Wind SSE.
19	63.4	63.2	13.0	15.5	Clear. Wind SSE. Evening cloudy.
20	66.1	61.4	25.0	9.0	Clear. Wind SSW. Even. cloudy. Wind SSE.
21	61.9	61.5	14.0	11.5	Cloudy. Wind S. Even. cloudy. Wind NNW.
22	63.5	60.9	13.5	7.5	Cloudy. Wind SSE. Even. cloudy. Wind NW.
23	61.7	60.0	8.0	6.0	Cloudy. Wind NW.; steady breeze. Evening cloudy and calm.
24	62.0	60.3	11.5	9.0	Cloudy. Wind NNW. Even. cloudy & calm.
25	63.2	61.0	16.5	12.5	Cloudy and nearly calm. Evening cloudy. Wind SSE.
26	61.4	60.3	9.0	7.0	Cloudy. Wind NW.; light breeze. Evening clear.
27	62.2	60.2	7.5	6.0	Cloudy. Wind SW.; light breeze. Evening cloudy.

		THERMOM.		HYGROM.
Mean of 10 A. M.		64.69		17.11
10 P. M.		62.15		10.54
10 and 10,		63.42		13.82
Maximum,	1st,	68.2	9th,	34.0
Minimum,	9th,	58.0	16th,	5.5

X.—*Memoir on the Geology of the Snowdon Range of Mountains, as connected with its Scenery, Soil, and Productions.*

By James Stuart Menteath, Esq.

(*Read* 14*th February* 1829.)

Few countries have afforded more delight to the traveller than Wales, which may, in a great measure, be ascribed to the imposing appearance of its romantic scenery. But though few pleasures certainly can be more gratifying than those that arise from the contemplation of a varied landscape, yet this country will be found to furnish materials for observation of a more useful and interesting kind.

To the person who considers geology as connected with the improvements of agriculture, with the resources of a country, and with the changes which the earth's surface is made to undergo in the progress of the arts, this district will afford an ample field of instructive inquiry. As the whole of this country, however, would be too extensive a subject for a single paper, we propose confining our remarks to that district which is situate in the north-west corner of Wales, and which may be denominated the Snowdon Range.

Wales, taken as a whole, may be considered as a mountain group of land, separated from England by the valleys or basins of the Dee and the Severn, much in the same manner as Galloway is disjoined from the rest of Scotland by the basins of the Ayr and the Nith; and Cumberland and Westmoreland from the north of England by the basins of the Lune and the Eden. As England is observed to be divided into very unequal portions by a ridge of hills which traverse it nearly from north to south, having to the east the principal level tracts of our island,—so we observe in Wales a similar mountainous range in a direction parallel to the central one of England, to which it is connected by a slightly elevated tract running betwixt the basins of the Dee and the Severn. From this central mountain-ridge of Wales, individual ridges branch off on each side, which are found generally to take the direction of SW. and NE.

One of these ridges, which cross the central range, viz. that which is most northerly, and forms the counties of Carnarvon and Anglesea, we propose to make the subject of our observations in this paper.

That we may have a clear idea of the district of North Wales we are about to describe, we cannot perhaps do better than ascend the summit of Snowdon, situate in the southern border of Carnarvonshire, and from this commanding height survey the surrounding country. From its lofty peak, 3546 feet above the sea, at Carnarvon Quay, we shall observe stretching in one direction SW., and in another NE., a lofty chain of mountains, some of them little inferior in elevation to Snowdon itself, and having it for a centre. On the NE. this range is terminated by the bold face of Penmaen Maur, rising almost perpendicularly from the sea to the elevation of 1200 feet; and on the SW. by the Rivels, equally elevated, and which terminate nearly opposite the Isle of Bardsey. The various masters of this district have, according to their fancy, differently named this range. The aborigines of this country, the Welch, have, from their summits occasionally being clad in snow, called them the *Eryri*, or Snowy Mountains; and Snowdon, the central point, they named *Wydfa*, or the Conspicuous. The Romans denominated them Montes Arvonii; and the Saxons, or English, the Snowdon Range. The greatest breadth of this chain is about twenty miles from north to south, and it is nearly fifty in length. In the whole range there are but few passes which admit of communication betwixt the opposite sides. The best road is by an opening between Bangor and Craneoge; and still this ascends no less than 1100 feet in about twelve miles.

Having thus examined the general course, the breadth and extent of this line of mountains, let us, while we stand on the summit of Snowdon, turn to the north, and we shall have before us, first, on the eastern side, the basin of the Conway; and, secondly, to the north-west, the great basin of the Menai, including the greatest part of Carnarvonshire, and the whole of the Island of Anglesea. If we then turn towards the south, we shall have, on our right, the basin of Cardigan Bay, including that part of the coast of Carnarvon which lies to the south of the Snowdon range.

In examining these districts we shall find considerable resemblance in some respects, as they are all of the same general geological structure; but, at the same time, many differences are also to be met with from the peculiar nature of the rock, in each of the districts; the inclination of the hills, and the subordinate substances which are peculiar to each.

As we have seen from the top of Snowdon, that the basin of the Conway is situate to the north of the range, it will be necessary that we may acquaint ourselves more particularly with its general characters, and contents, to DESCEND the mountain, and traverse in all directions the valley.

Accordingly, on examining it, we shall find that, in length, from north to south, it extends upwards of twenty miles, in breadth scarcely eight; at the southern end, for seven or eight miles, it is very narrow and confined, and, towards the centre, it gradually enlarges itself to its greatest dimensions, and maintains nearly the same breadth to the mouth of the Conway.

On the west, or Carnarvonshire side, it is separated from the Menai basin by the Snowdon range; on the east side, it includes a part of Denbigh, cut off from the remainder of that county by a low ridge of hills, running parallel with the more lofty hills of the western side of the basin.

The prevailing rock of this valley is transition-slate; and it is observed, that, where it is hardest and least decomposable, the features of the basin are more rugged and bold; and the reverse, when this slaty rock is less tenacious. Agreeable to this idea, it is found that the higher portions of the Conway basin, surrounded by such unyielding rocks, is wild, broken, and irregular. And as we descend northwards along the course of the Conway, softer and more pleasing appearances present themselves to the eye.

The mountains on the west, or Carnarvon side, are lofty and abrupt, and, from their vertical structure and unyielding composition, offer a peaked, varied outline. And from the long resistance these slaty mountains make to the action of water, a series of small lakes are met with at their base, being the fountains of as many streams which burst through the covering of wood, and find their way into the interior of the basin.

Among the principal rivers of this district are, the

Machno, the Lledar, the Llugury, and the Conway, all descending from the lofty range which form the west side of the valley.

The Machno has its source to the south-east of Snowdon, and, after a run of eight miles, unites its waters with the Conway.

The Lledar takes its rise from some small lakes to the south of Dolwyddelan Castle, and, after washing the walls of that ancient pile, joins the Llugury above Betteos y Coed.

The Llugury comes from a marshy piece of ground to the south of Capel Curig. Near Betteos y Coed, at Rhaidry Wermol, it precipitates itself, in foam and spray, down into a chasm 100 feet deep, presenting a grand cascade; and at Betteos its waters meet the Conway.

These three above-described streams take a north-easterly direction, and run in narrow rocky channels.

The Conway, the largest river, and which gives its name to this basin, issues from an inconsiderable lake, ten miles to the south of Snowdon. Meeting with much obstruction from rocks impeding its passage, for a great part of its course it is quite a mountain-torrent. When it arrives at Betteos, it becomes more tranquil: and at Trefriew, eight miles from its mouth, it becomes navigable for vessels of light tonnage.

From this short and hasty description, it is evident that the Valley of Conway must afford many interesting scenes to the lover of landscape. The mountains rise to a great height, with numerous beautiful streams descending from their sides, and many lakes enlivening the valleys that are formed in their various recesses. From the rivers and streams having to form their passage through hard slaty rocks, at one time opposing, in the form of immense blocks crowding the channel, the farther descent of the water—

and, as it were, at another time actually damming up the stream, thereby forming in many places frequent cascades and waterfalls—and the banks of these streams being fringed with finely-disposed copsewood, a great additional charm is thus given to this basin, by these necessary parts of a beautiful varied scene. And as the rocks of the western boundary of the Conway basin are not of a friable texture, and as soil must always be produced by the underlaying rocks undergoing decomposition, it might be expected that the higher declivities of the Snowdon chain should be covered but with a scanty portion of it. Accordingly we find these higher elevations provided with a thin, poor soil, generally producing some of the coarser kinds of herbage. The furze, or gorse, or whin, is observed to spring naturally on these high surfaces, and often extensively covers portions of them. In descending towards the more level parts of the basin, in consequence of the finer and lighter particles of the decomposed slaty rocks being borne along by the water, and deposited according to their various specific gravities, we find a variety of soil, more or less fitted for the production of good herbage and root-crops. And along the banks of the Conway is as rich alluvial land as can anywhere be met with.

In respect of climate, from the peculiar situation of the Conway Basin, though defended by the chain of the Snowdon Alps from the violence of the south-westerly gales, the weather is often cold and severe. These high mountains to the west bring down upon the basin much storm and wind; and being well protected by them from the sea-breeze, the snow often lies within it a considerable time. But at its northern extremity, where the Orme's Head Peninsula opens to the sea, we find the climate so far moderated by its influence, that certain delicate plants, as the Hydrangias, are able to stand out all the winter.

Except the central part of the basin, near Trefriew, where the alluvial banks of the Conway are marshy, and thought to produce occasionally intermittent fever, the general climate of this basin is healthy and invigorating.

In cultivation, though not of the most productive kind that could be followed, this basin presents rather a pleasing picture to the agriculturist. As we have described the slaty rocks of the upper parts to be incapable of much decomposition, little scope is there given for the plough. But below Betteos, proceeding downwards to the north, we observe the slopes of the Snowdon chain of more decomposable materials, inclining more gently, cultivated a considerable way up, and yielding crops of oats. But the lower and leveller parts are employed for raising barley and wheat. Little, or to no extent, are turnips cultivated, which, in a country rearing cattle and flocks of sheep, is a great defect. And deficiency of soil cannot be assigned as a reason for such an omission; for, in the arable parts of this basin it is generally light friable loam, than which nothing can be better adapted, either for the production of the turnip-crop, or the feeding of them off with sheep.

Little attention, notwithstanding the great demand for winter food, is paid to the management of grass-lands in this basin. The heights, and those parts that are uncultivated, of the Snowdon chain, forming the western boundary of the Conway basin, are, for the most part, common lands, and are grazed by those having farms skirting them, without any particular limitation as to the number of stock to be turned out upon them. Accordingly, we find these mountain tracts eaten to the very root, very little heath, and the stock depasturing them often not in the best condition. This we shall find more remarkably the case in the Carnarvon part of the Menai basin. From the scantiness of heath, and other plants which supply food for that bird, grouse does not abound on the Snowdon range; and few or none of the black game are found.

Were advantage taken of the numerous streams which fall from the hills on the western side of the basin, to convey them in proper channels for the purposes of irrigation, immense additional produce of hay might be obtained. A striking instance of the want of drainage, and of the mischief water makes in the finest alluvial land, is to be seen near Trefriew. A tract of land there, of several hundred acres, level, and of the richest vegetable mould, by being drenched or oversaturated by some mountain-streams, is now worthless and unproductive, and contaminates by its stagnant exhalations the otherwise pure atmosphere of the vicinity. A very little expense might soon, by carrying away this superfluous water, and by judicious irrigation, convert it into one of the most productive spots of the basin.

Great advantage might also be derived, for enriching the grass-lands of the basin, by employing more extensively the limestone of the Orme's Head in the way of top-dressing. Now, however, what is employed in agriculture seems principally given to the tillage-lands.

Notwithstanding the drawbacks in rearing good stock just described, the cattle and sheep of this basin will generally be found as large and well formed as in the other districts of North Wales.

Having already remarked that the slopes of the mountains of the Conway basin, as well as the banks of the rivers, and waters, are well clothed with wood, it is scarcely necessary to mention, that nearly all the varieties of timber are observed to grow well. Higher up in the basin, to the south, we find, as we might expect from its high elevation, the birch, the alder, and the mountain-ash. But by the extensive plantations within these few years made on the estate of Lord Gwydir, in addition to the above woods, the larch has been added. And as the slaty rock on which they are growing somewhat corresponds to the nature of the primitive mountains of the Swiss Alps, where that tree grows naturally, and attains great age and dimensions, we may expect the same will happen in this district.

Though many of them have not been more than eight years planted, yet they exceed twenty feet in height, and evince great vigour. At Betteos, and at Gwydir-house, the oak and the Spanish chesnut (of the last of which, one at Gwydir girths 13 feet) thrive as well as in the lower parts of the basin. This may be much owing to their having the shelter of the Snowdon chain to protect them from the frequent blasts of the south-west.

To complete our sketch of the appearance of the Conway basin, it may not be amiss rapidly to glance at the Denbigh side. A very cursory observation will soon discover features considerably different from the Carnarvon side of this district. While the western presents a bold, peaked outline of mountains, rising to a considerable elevation, the eastern, or Denbigh portion, has characters of a very different nature. Though its hills, composed of a very decomposable slate, are low, and rounded in their summits, yet, being clothed in wood, they offer a pleasing picture for the eye to contemplate; and cultivation being carried in many places to the most elevated points of the ridge, and the gently sloping declivities being adorned with neat farm-houses, villas, villages, and towns, the Denbigh side of this basin is rendered highly attractive and beautiful. Among the towns of this side, Llanroost, delightfully situate on the eastern bank of the Conway, with its venerable church, and Inigo Jones' bridge, may be considered as one of the most interesting.

If the Conway basin be thus interesting to the lover of scenery and the agriculturist, it is no less so to the practical mineralogist. It possesses in different places valuable mineral treasures of great importance in the arts.

Of these, slate may be considered as the most abundant. The general nature of this rock, however, not being very hard, no great quantity of it is found fit for roofing-slate. The best for that purpose is what is raised on the banks of the Lledar, above Dolwyddelan Castle, and to the east of Snowdon. It may be remarked, that the slaty rocks being here very hard, good roofing-slate is accordingly raised. It is conveyed in carts upwards of twelve miles, and, being shipped at Trefriew, forms a considerable article of export. Many thousand tons are annually shipped. But the colour of the slate being reddish, is by some considered objectionable, and from this prejudice a less quantity is sold than might be expected. No other slate, fitted for architectural purposes, is elsewhere worked, except near Trefriew; and its sale is very limited, being not so good as the Lledar slate, and very inferior to what we shall afterwards find on the other side of the Snowdon range.

The slate is frequently penetrated on the western side of the basin by dikes of whinstone, of no great thickness; and it is invariably found where these occur, that the slate in immediate contact with them becomes harder and tougher. This trap-rock being so conveniently dispersed, is employed as the common material for road-metal.

Of quartz, or buhrstone, a considerable quantity is found within a mile, and to the west, of the town of Conway. The quartzy buhrstone has occasionally been employed as a millstone, but is not found to answer so well as that which comes from France. It is imbedded in a soapy aluminous stone, and forms the eastern point of Penmaen Bach. The aluminous soap rock, being burned, becomes of a beautiful white colour; and being sent into the Staffordshire pottery districts, there becomes one of the ingredients of porcelain.

At the northern end of the basin of Conway, in the promontory of Orme's Head, limestone abounds. It constitutes, with small intervening strata of ochery, yellowish soft sandstone, the predominant rock of this end of the district. It is quarried, burnt, and in considerable quantities exported for building and agricultural purposes. It may be observed, that the north-western extremity of the Orme's Head, rising to a great height, forms a strong bulwark against the sea: and that its steep inaccessible front, on that quarter, is the retreat and breeding-place of immense flocks of water-fowl; and among them is the peregrine falcon, so famous in the days of chivalry for the sport it afforded in falconry.

It may also be remarked, in passing, that the southern side of the Orme's Head abounds in several rare plants, among which are the Mespilus Cotoneaster, or Medlar, nowhere else in Britain found growing; Anthericum scrotinum, Pulmonaria maritima, and many other scarce plants. Not only along the shore of the Orme's Head peninsula, but also very generally on the Carnarvonshire coast, the Crambe maritima, or Sea-kale, grows luxuriantly.

Of metals, the most important, and which is found in greater abundance than any other, is lead. At Pont Glyn Bridge, half-way between Capel Curig Inn and Betteos y Coed, on the banks of the Llugury, it is found; and from some appearances here, as well as in other parts of this basin, it would seem that this metal was probably known to the Romans, and worked by them. But it abounds in greater quantities at Booleh Heim, a tract of country, including nearly three square miles, situate about two miles to the west of Gwydir-house. From time immemorial excavations have been carrying on here. And a race of men has sprung up, following the occupation of mining, from father to son, for many generations.

The lead-veins are found in the slaty mountain rocks. The matrix of the ore is a quartzy calcareous spar.

The pits are numerous and shallow, seldom more than twelve feet below the surface. The veins run east and west, and are crossed by others from north to south; they have scarcely any dip, running nearly horizontal, but rise a little as they enter the hill to the east and south. The breadth of the vein is narrow, seldom exceeding eighteen inches.

Calamine is also found here, but not in similar quantity to the lead. When it is separated from its extraneous matters, it is exported solely to Bristol.

In the limestone, on the south-west side of the great Orme's Head, copper is found in considerable abundance, principally the malachite, or green carbonate of copper. It is found in the limestone strata, between beds of coarse yellowish sandstone. The shafts penetrate to a considerable depth. Many hundred tons are every year raised. After the extraneous matters have been separated, by breaking the ore into small pieces, and washing away other impurities, it is put into bags, and sent away to Swansea; and there, from the abundance of coal, is smelted, and prepared for useful purposes.

Though there be no coal, peat is found in several places, but in no considerable quantity, except in the great marsh formed at Trefriew, on the banks of the Conway, where is an abundant formation of it. The nature of the rocks of the mountains, their steep declivities, and the drainage of those parts of them fitted either for pasture or tillage, admit of little space for the accumulation of this vegetable production. The margins of the mountain lakes, generally of little extent, and occasionally hollows in the mountains, are the spots where peat oftenest occurs.

Though we have seen that nature furnishes a considerable quantity of useful materials in this narrow space, it does not appear that sufficient advantage has been taken of its circumstances, in regard to the arts. And though, no doubt, wool has been from time immemorial manufactured into flannel, the great staple of the country, yet neither this, nor any other manufacture, has been carried to the extent it might.

This basin is near to the great sea-port of Liverpool; has a river navigable for many miles, which admits of having coal and other heavy articles easily conveyed; it is from the nature of its soil healthy; and what is of still more importance, there are few places more fitted, from its geological structure, to afford an easy command of water-power. Almost every stream, as has already been stated, has in its course a lake of greater or less extent, which would supply water at almost all seasons of the year; or, in some cases, a slight embankment at the mouth of these lakes would be all that would be necessary to ensure an ample supply of water for every kind of machinery.

It is not easy to conceive why a situation possessing such advantages should not have been selected as a station for manufactures.

Though not strictly connected with the object of this paper, which is more particularly intended to describe the natural features, the geological structure, and the resources which these afford, we cannot omit stating, that this romantic valley is not without interest to the lover of ancient architecture.

In the venerable mansions of Gwydir, Bodysgallen, and Gloddarth, the latter noted for its fine old baronial hall, and valuable library of books and Welsh manuscripts, we have good specimens of the style of building in the reigns of Henry Seventh, Henry Eighth, and Elizabeth. And within the embattled walls of Conway, more like an eastern fort than an European town, are several splendid old buildings, of as beautiful architecture, and of equal or greater antiquity. It cannot be doubted, from the spacious halls with which these old houses are all furnished, that hospitality, in former times, extensively prevailed in this district.

This charming vale has also to boast of designs in architecture executed by one of our greatest artists, the celebrated Inigo Jones. This ornament of his country, while he was erecting monuments to his architectural fame all over the island, did not forget to adorn Llanroost, generally believed to be the place of his nativity. Here he erected a beautiful chapel, connected with the parish church; and constructed a bridge, in 1630, over the Conway; memorials of his affection for the town that gave him birth.

The last, and perhaps the most interesting of all the architectural objects of this basin, is the Castle of Conway. This is the work of Edward the First, who, to secure his entrance into this country, fixed on this spot as the site of a stronghold. This building has long been deservedly admired, for grandeur and symmetry of outline, and elegance of architecture; and, like the Castles of Dumbarton and Edinburgh, stands on a basaltic rock; which is, however, much inferior to either of these in elevation.

MENAI BASIN.

Having pointed out, in the sketch just given of the Conway basin, those external appearances, objects and productions, which cannot fail to attract the attention of the traveller as he attentively surveys this delightful vale, we shall now pass into the basin of the Menai, where we shall find a more extensive field of observation.

That we may have at one glance a clear general idea of the extent, boundaries, and external appearance, of this district, it will be necessary to ascend Penmaen Maur, which rises to the height of nearly 1400 feet above the level of the sea.

In looking from this point to the south-west, we shall have before us, on the left hand, the whole chain of the Snowdon mountains, ranging in that direction nearly forty miles; and, on the right, appears the whole island of Anglesea, which, except at north-west, is comparatively flat, or broken into slight elevations. In that quarter, and in part of the east, a steep rocky mountainous shore, though by no means to be compared in height to the Snowdon chain, rises to protect this portion of the island from the violence of the winds which blow in that direction.

As we found, in examining the basin of the Conway, that it was less perplexing to examine regularly one side of the basin before passing to the other, we propose following the same method with that into which we have now entered,—and accordingly begin our remarks with the Carnarvon side.

In casting the eye along the Snowdon range, we shall observe several lofty summits, the highest of which is the peak of Snowdon, being 3561 feet above the level of the sea.

Towards each extremity of the chain the mountains gradually decrease in height. The Rivels, on the south-western termination, are 1866 feet, and Penmaen Maur, on the north-east boundary, is 1400 feet above the sea. These mountains present a noble, alpine group, conically peaked, craggy, and rugged in their outline; and when their summits are gilded by the rays either of a rising or a setting sun, they afford one of the grandest objects of contemplation in England.

The surface of this side of the basin is varied and broken into many inequalities. Little of it is level. The little vale of Ugivulchy, situate between Penmaen Maur and Penmaen Bach, is one of the levellest tracts of land of this side of the basin. There are other spots along the Carnarvon shore also tolerably flat, such as near the mouths of the Aber and the Ogwen; and another tract, the largest between Carnarvon and Clynog, may be adduced as the levellest portions of the basin. For a considerable distance, in the vicinity of the Snowdon chain, great blocks of rock, immense boulders, quantities of large stones and gravel, strew and cover the ground, particularly where the Seiont issues from the ravine in which the lakes of Llanberris are situate.

Scarcely so many streams have their sources on the western side of this chain, as those we have already described on the eastern. Among the largest are the Ugivulchy, the Aber, the Ogwen, the Cegin, the Seiont, the Goorfai, and the Nantle.

The course of the Ugivulchy, which waters one of the sweetest vales of the Menai basin, is but very limited.

The Aber proceeds from a deep wooded ravine, and, after passing the mouldering walls of Prince Llewellyn's

Castle and the little town of Aber, enters Beaumaris Bay, three miles to the south of Penmaen Maur.

The Ogwen, presenting more of the characters of a rapid mountain-torrent than any of the streams of this basin, being impeded continually in its descent by vast fragments of rock, issues from the dark gloomy Lake of Ogwen. It then passes through the romantic vale of *Nant Francon*, or the Vale of the Beaver; and, having on the south bank the Dolawen slate-quarry iron-railway, and the new Holyhead road, it passes into the Bay of Beaumaris, half a mile to the south of Port Penryn. For more than five miles of the lower part of its course, the banks of the Ogwen are most beautifully fringed with natural wood.

The Cegin, an inconsiderable stream, after putting in motion some machinery, enters the bay at Port Penryn; and forms the quay whence the Dolawen slate is shipped to all quarters of the globe.

Next in order, but much superior in size, is the Seiont, which has its source in the two charming lakes of Llanberris. From the quantity of water it receives from the many small rivulets which furrow the face of the lofty Snowdon, the Seiont may be considered the largest river of the basin of the Menai. Except where it passes the woods of Llandenon, this river has its banks naked and woodless. After washing the walls of the Castle of Carnarvon, and forming a harbour for shipping, it enters the Menai Strait.

The Goorfai rises in the small but pretty lake of Quetlyn, and in its descent runs through some fine meadow-ground; and within two miles of its mouth, near Poolhelly-road, affords delightful scenery.

The last river of any note of this basin, is the Nantle, which, taking its rise from the two lakes of Llanlyfne and

Nantle, enters the sea nearly three miles to the north of Clynog.

Except the Lake of Bala, in Merionethshire, no district of North Wales affords larger and more beautiful lakes than this chain of Snowdon. Those of Llanberris, Ogwen, Nantle, and Llanlyfne, are the finest. But in grand, bold, rocky mountain scenery, the two lakes of Llanberris surpass them all. These, and some others, are interesting to the angler, as well as the lover of scenery, as they abound in char, trout, and salmon.

From appearances so varied, from a chain of mountains rising so far above the plain, deeply furrowed by the storm, conical in their outline, and excavated by numerous torrents into deep hollows or glens, almost invariably filled with lakes, and, from the less elevated parts being intersected by several rivers, with banks affording a bold, rich, and varied scenery, the landscape cannot fail to be highly interesting.

As the rocks of the Carnarvon side of the Menai basin are so very hard as almost to resist the action of the weather, the soil on the declivities of the mountains is thin, scanty, and gravelly. Towards the interior of this side, although deeper, it is of a very light texture. In the vale of Ugivulchy, the soil is more abundant, and of a loamy nature, owing to the softer texture of the rocks which enclose it on the south. Along the shores of Beaumaris Bay, it is deeper, and more argillaceous. To the north of Carnarvon, for three or four miles along the Menai Strait, the soil covering the secondary rocks, limestone and small clayey strata, is rich and productive. Also between Carnarvon and Clynog it is generally good, partaking in some places of a sandy loam, admirably fitted for turnip husbandry. It is surprising that, in this country, where rainy weather is so prevalent, peat-soil is so rarely to be met with. But the steepness of the mountain acclivities, and the undecomposable nature of the rocks, may, in some degree, account for the scarcity of this vegetable formation. And, as we have already remarked, in consequence of almost every hollow being filled with water to a great depth, little space is left for the formation of it. It is generally to be found along the swampy margin of the mountain lakes.

In respect of climate, this eastern side of the basin suffers severely. The mountainous parts of Anglesea, being of inconsiderable elevation, expose the Carnarvon side to the fury of the south-westerly wind; and after a severe storm from that quarter, it is not an unusual occurrence to observe the windows, many miles inland, encrusted with a saline spray. It is chiefly owing to these blasts from the Atlantic, that the trees along the western coast of this island, subjected to their pernicious influence, are so stinted in growth.

Although these south-westerly winds are unfavourable to plants and trees when exposed to them, yet the climate of this district is very conducive to health and longevity. Of those who received parochial relief, in 1810, in the town of Carnarvon, the inhabitants of which amount to 6000, nineteen were from 80 to 90 years age, twenty-eight from 70 to 80, forty-two from 68 to 77, and thirty-nine from 50 to 60.

We even find from the uniform general temperature, produced by its vicinity to the ocean, that, during the winter months, certain delicate shrubs and plants, incapable of enduring exposure in that season in the more inland districts of England, are here enabled, with little or no protection, to exist in great vigour. We allude to such plants as the hydrangia, the arbutus, the sweet-scented bay, the mulberry, and the myrtle, which, in some spots

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Though the climate of the Carnarvonshire coast is mild, notwithstanding the severity of the south-westerly gales, yet, from the scantiness of its soil, it is neither rich in pasture, nor favourable to the growth of grain. The immense fall of rain, and its consequent evaporation, produces much moisture in its atmosphere. But its numerous population, created by the preparation for market of its various mineral treasures, have been disregardful of these natural obstacles, and drawn as much as possible from the land.

Little of the soil, formed principally of particles of quartz, of the softer slate rocks, and of a great mixture of large and small rounded pebbles, with little of a rich loamy nature, is fitted for a vigorous vegetation. In such circumstances it is not to be expected that vegetable productions should be abundant.

The lovers of botany will, no doubt, find specimens of many rare plants nestled among the rocks of this alpine tract, but it is only in a few spots along the shore and in the valleys that rich crops of any kind are produced. The slopes of the ridge, being generally very steep, are cultivated only a short way up. The higher parts support but a scanty vegetation. Wheat, however, is cultivated rather extensively, much to the impoverishment of the land. The sweet vale of Ugivulchy, a tract of a light loamy soil, near the mouth of the Aber, and some places along the shore between Carnarvon and Clynnog, appear best calculated for the production of this grain.

From the light composition of the greater part of the soil of this portion of the Menai basin, barley is the grain that ought to be principally raised; and, being the chief food of the labourer, its production is highly important to be more extended. On the higher grounds, where the declivities of the mountain are covered with soil, oats are raised.

In describing the culture of the soil of the Conway side of the Snowdon chain, we had occasion to remark that little or no turnip was raised, though all the tillage land of that basin was well fitted for the raising of that root. The same remark may be made in reference to this side of the Snowdon mountains. Except on the home-farms of Mr D. Pennant and Lord Newborough, scarce a field is to be seen elsewhere. Perhaps, besides the erroneous prejudice entertained against the cultivation of this most valuable plant by the Carnarvonshire farmer, an additional obstacle may arise from the small extent of his farm, which seldom exceeds 100 acres; oftener not more than 50, and even less; and held at will, as leases are scarcely ever granted. As there is a great demand for potatoes, the farmer devotes his manure to the raising of that useful crop. But as the greatest part of that crop is sold, his land is annually deprived of much of its fertility by having no green crop, yielding much manure, to balance the loss thus occasioned by carrying the potatoes off the farm.

As milk, butter, and butter-milk, are articles of great demand, in this district, among the labourers, it might be expected that great attention would be given to turn to useful purposes the abundance of water its rivers supply, for irrigation. But we do not find that as yet that has been done. Scarcely any good artificial water meadows have been formed. The management of the upland meadow-ground is also defective. If, from the geological structure, the soil be so deficient, and vegetation so scanty, and consequently the food of the cattle and sheep necessarily not abundant, every means that art can supply ought to be employed, to raise larger quantities of grass and hay. Irrigation, accordingly, judiciously conducted, would afford an ample increase of food for the winter-famished flock. From the overstocking of the commons, which occupy the heights and sides of the Snowdon chain, the sheep, averaging little more than 7 ℔ a quarter, are small, barely clad with wool, which, though fine, seldom exceeds ½ ℔ in a fleece; and are not in that well fed condition to bear the deprivations of a winter storm. Consequently, from the sheep-farmer having no green food or hay to spare for his flocks during that season of the year, numbers annually perish.

The cattle, from want of adequate food, are small; but being fed with a little hay in winter, do not suffer so much as the sheep. As one of the articles of food at this season, and during the early part of spring, it may be remarked, that the furze, or large French whin, is raised in considerable quantities, and is employed as food for the horse and cow. It is prepared by bruizing it in small water-mills, erected for that purpose. The water-wheel is made to turn an axle, on which are fixed, at right angles to it, several iron spikes ten inches long, and these are made to revolve within a large circular wooden cover, twelve inches in diameter, similarly fitted up with spikes; and these spikes of the axle, in their revolution, pass between those of the circular wooden cover. A small hopper is attached to the top of the circular cover, which, holding the furze, it is in this way brought into contact with these iron teeth, and is soon crushed into a state fit for the food of animals.

This side of the Menai basin is scantily furnished with wood. The thin soil covering the western declivity of the Snowdon chain, and the violence of the frequent south-westerly winds, render this district very unfavourable to the growth of it. Tradition says, that the Snowdon range was formerly covered with wood; and the name which it received, after Edward the First's entrance into North

Wales, of the Forest of Snowdon, seems to have favoured the above belief. We can, however, with difficulty believe that it extended to the higher parts, as Giraldus Cambrensis, Leland, and others of the older writers, would not have omitted so important a fact. The shores of the lakes of Llanberris, since the introduction of goats, sheep, and cattle, have been almost robbed of their wood, though, in the reign of Elizabeth, these low tracts seem to have been well clothed, and abounded in deer. Should the proprietors of the banks of these beautifully romantic lakes wish to see them again adorned with natural copse-wood and timber, evidence can be adduced to prove, that it is only necessary to protect them from the ravages of cattle and sheep. On the east side of the lower lake of Llanberris, nearly opposite the ruined castle of Dolbadern, a considerable extent of that shore has been walled in, and is now spontaneously covering itself with oak and smaller brushwood.

As not unconnected with this subject, it may be remarked, that, in a particular spot of this district, American plants thrive most luxuriantly. At Penissar-Naut, on the Ogwen, the beautiful wooded romantic dairy-farm of the late Lady Penryn, a rhododendron, growing from one stem, may be seen covering a circumference of thirty-two yards.

It is not from the productive nature of its soil that this rugged tract derives its wealth, but from its minerals.

The person unacquainted with the geology of the Carnarvon side of the Menai basin, might be led to consider it as having few sources of wealth. The geologist, however, on the contrary, explores countries and districts, not to examine the surface alone, but, with enlarged views, to explore all the mineral and metallic deposites, in order to ascertain how far they have been, and may still be, the means of creating wealth and industry in a country. Such a one will find this district abounding in minerals and metals of a highly important kind.

We have already observed, in describing, generally, the mountain chain of Snowdon, that the rocks of which it is composed have for the most part a slaty vertical structure; and, except on the eastern and southern faces of Snowdon itself, and in a few other places of this range, where somewhat of a columnar basaltic formation appears, the slaty vertical structure, more or less, may be said to characterize the whole chain of Snowdon.

Though such great masses of slaty rocks everywhere abound, they are not always of a quality fit for use. The best is found in a line north and south, between the south bank of the Ogwen, where it issues from the wild and rocky glen of Nant Francon, and the eastern bank of the lakes of Llanberris; and in another line, in the same direction, but at some distance from the first, stretching from the western bank of the lower lake of Llanberris, viz. at Glyn to Nantle and Llanlyfne lakes. Between these two lines are several parallel slate veins wrought at present. But in many other places in the Snowdon range, as perceived in sections exposed to view by the streams running through the deep dingles they have formed, other similar parallel veins of slate crossing them are traceable.

These veins are found frequently to alternate with very hard rocks, approaching in appearance to the hardest basalt and greywacke; at other times, again, with very hard darkish black and light coloured quartzy rock, which assumes the same vertical structure as slate;—and the best workable slate is always found to be that which is enclosed in such a hard rock.

Carnarvon Slate.

One of the finest and most extensive slate-quarries of this range is that at Dolawen, belonging to Mr D. Pennant, on the south bank of the river Ogwen, about six miles from Bangor.

The quarry is situate on the face of a lofty hill. The vein ranges from south-west to north-east, as do all the slate veins of this district; and its dip is nearly vertical to the horizon. It is included in a hard blackish greywacke sort of rock. The breadth of the quarry, now working, and which has been opened considerably more than forty years, is no less than 300 yards, and about 100 in depth. In colour it is blue, reddish, and green; but these varieties occur generally in separate veins, though occasionally passing into each other. The blue, which predominates, is excelled in hardness and durability by no other slate anywhere found. It splits readily and easily into the thinnest laminæ or plates, and may be obtained of any size; and almost any kind of architectural article can be made of it, as roofing-slate, flooring-flags, window and door jambs, chimney-pieces, tombstones, and various other articles.

This great vein of slate is penetrated about the middle, from south to north, by a hard quartzy vein, having occasional traces of sulphuret of lead. The slate in immediate contact with this dike or vein of quartz is much inferior in quality, as it splits less readily.

The slate of this quarry cannot be raised without the assistance of gunpowder. Though great quantities are thus separated and brought down, much is shattered and rendered useless by the explosion. Being removed from the quarry, and prepared for architectural purposes, it is then, by means of an iron-railway, upwards of six miles in length, transported to Port Penryn, within a mile of Bangor, where it is shipped for all quarters of the globe.

At this quarry a useful piece of machinery, put in motion by water, is employed for sawing and cutting slate into tombstones, jambs, and such like. Near Port Penryn is a writing-slate manufactory. Of the refuse slabs of slate very good fences are made; some that are long enough are fastened together with iron-nails, like post and rails, and in that form look well, and answer a good purpose.

The returns from this quarry in the course of a year are immense, many thousand tons being sold and exported. Nearly a thousand men are daily to be seen at work; and from the interesting appearance of the various workings of the Dolawen slate-quarry, and the great extent of the operations, few places can afford a higher treat to the practical mineralogist.

Were instances wanting to exemplify the vast advantage iron-railways confer in prosecuting great works, at less expense, and with greater expedition, over common roads, repaired and engineered on the best principles, the iron-railway at Dolawen slate-quarry may be adduced. It is said, that, before the present one was laid down, nearly 400 horses were required to convey the slates from the quarry to Port Penryn; but with the assistance of the railway, 20 horses can do all the carriage.

The next slate-quarry worthy of examination is that of Alt Dhu, belonging to Mr A. Smith, situate on the eastern bank of the lower lake of Llanberris, on the steep declivity of a mountain rising not much less than 2000 feet above the level of the sea. This slate-vein, which is evidently the continuation to the south-west of Dolawen vein, on the Ogwen, first described, passes along the Alt Dhu mountain. In thickness it is 300 yards, and in height not much less. It consists, like that of Dolawen, of three kinds, the blue, the red, and the green. The blue, being most preferred, is the most valuable to the proprietor, though the other two are equally durable. These veins are included between hard dark-coloured greywacke rocks, and are penetrated through, from the north to south, by a sparry vein containing pieces of galena, and now and then sulphuret of copper. This dike deranges the structure of the slate near it, and renders it unfit for splitting.

This quarry surpasses all others in convenience of removal of rubbish. Placed on a high steep face of a hill, the refuse is easily got rid of, and all obstruction in the working of it is prevented. On a railway of iron, seven miles long, extending to the Menai Strait, the slate is conveyed to the shipping.

In this quarry of Alt Dhu 800 workmen are generally employed.

The situation of these quarrymen is often exceedingly perilous. In the course of boring and blasting the slate-rock, they have to descend by ropes perpendicularly 100 feet or more; and, in this position, suspended in the air, they fearlessly proceed in their operations.

> —"How fearful
> And dizzy 'tis to cast one's eyes so low!
> The crows and choughs that wing the midway air
> Show scarce so gross as beetles: half way down
> Hangs one that gathers samphire; dreadful trade!
> Methinks he seems no bigger than his head."
> SHAKSPEARE.

Two ropes are employed by these men; the one they coil round their body and one of their thighs; and the other rope they hold in their hands, and with wonderful dexterity, raise or lower themselves at pleasure.

Good workable slate is raised also in considerable quantities at Clogwyn, on the western bank of the lake of Llanberris, nearly opposite to that of Alt Dhu, and on the north side of Nantle and Llanlyfne lakes. From the latter place an iron-railway has just been completed, nine miles in length, to connect these quarries with the port of Carnarvon. The colour of these slates is reddish, and they are not equal in quality to those of Dolawen and Alt Dhu. The veins of slate being entered from the surface, and sunk into a great depth, considerable more expense in machinery is necessarily incurred in draining and freeing the workings of rubbish in these quarries, than in the two first described.

Before passing to the consideration of the other minerals of this side of the Menai basin, it may not be uninteresting to remark, that no less a quantity than 200,000 tons of slate is annually shipped from the above described quarries. And when to this we add their value, not much less than £400,000 a-year being paid for them, thus enriching the proprietor, and affording, at the same time, a comfortable livelihood to a population of 20,000 people, including wives and children, some idea may be formed of the immense importance of slate to the county of Carnarvon*.

The other transition-rocks which are found in this portion of the Menai basin, are more curious than valuable. Around the eastern and northern faces of Snowdon, as seen from the pass of Llanberris, hornblende, porphyry, basalt, greywacke, quartz, and micaceous rocks, are observed, as well as on the sides of some others of the higher mountains of this range. The rocks in these places have less of the slaty vertical structure, which is so predominant elsewhere. They often assume, when the basalt prevails, a columnar form. Near the summit of Snowdon, in the hard greywacke, impressions of shells are found, proving, in the clearest manner, that all the rocks of this chain belong to the transition-formation.

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* We cannot here refrain from observing, that these quarrymen, though civil and industrious, do not possess the same information and intelligence that the miners of Leadhills and of Wanlockhead, in Scotland, have. While the latter have extensive libraries to instruct them, the slate quarrymen and miners of North Wales are entirely without these valuable sources of mental improvement. It may be remarked, that the miners of Leadhills have a library of 1200 volumes; and those of Wanlockhead, another of 700 volumes. All which books are more thoroughly read, and more anxiously sought after by the industrious miner, than the numerous and splendid collections in many of the libraries in the low country; hence these people are comparatively well informed.

In cutting a new road along the western side of the lower Llanberris lake, fine sections of the hard rocks are exposed to view. We can there trace veins of asbestus, from an inch to three or four in thickness, passing through a tough asbestine greenish slate rock; and in other places of this road, in the sections so formed, are great blocks of amygdaloid, and coarse conglomerate puddingstone rock, which, from the extreme hardness of the cementing matter, and from the beauty of some of the imbedded pebbles, might probably be sawed and polished into ornamental slabs for tables.

Two fine examples of immense masses of basalt are afforded in the hills of Penmaen Bach and Penmaen Maur. The cap or summit of the latter in appearance resembles much a volcanic crater. It is curious to observe, that the north-west front of this last hill is the favourite resort of multitudes of the common house-swallow, whose clayey nest covers in many places the rock;

—"This guest of summer,
The temple-haunting Martlet, does approve,
By his loved mansionry, that the heaven's breath
Smells wooingly here: no jutty frieze,
Buttress, nor coigne of vantage, but this bird
Hath made his pendent bed and procreant cradle.
Where they most breed and haunt, I have observed,
The air is delicate." SHAKSPEARE.

In no other part of this side of the Menai basin are the secondary rocks observed, except lining the eastern shore of the Menai Strait, between Bangor and Carnarvon. In this direction they occupy but a narrow space, not exceeding a quarter of a mile in breadth. They overlie the transition rocks, and have their dip to the south-west, at a less angle than 45° with the horizon.

Among these secondary rocks all the varieties of sandstone may be seen. The old red is the lowest, and in contact with transition slaty rock; and between it and the new red sandstone, the other series of sandstone, mountain limestone, and the coal measures. An interesting section of all these rocks, for the geologist, is offered in the quarry that was opened for materials to construct the masonry of the Menai iron-bridge. This quarry is about a mile to the north of that bridge, and is contiguous to the Menai Strait.

The whole of the Snowdon chain may be said to abound in the metals, but, as we found to be the case with workable slate, their quantities are greatest in those parts of this range where the rocks are hardest, and least given to decomposition.

Of all the metals met with in these mountains, copper is the most abundant. The richest mine of this metal is in Snowdon mountain, which is traversed from south to west by several traceable copper-veins; but only two of them are worked; though in several other places, as to south-west of Penmaen Bach, on the banks of the Ogwen at Coitmore, in a ravine between the Bethgelert road and Nantle lake, it is found, but in smaller quantities, and in less purity, than that of Snowdon.

In the mountain of Snowdon, we have just mentioned that two different veins of copper are now wrought. The richest metal is that which is got in the vein situate near its summit; and on its north-east side, it there exists as sulphuret and sulphate of copper. The other vein is at the foot of Snowdon, on the west bank of the upper lake of Llanberris, and within half a mile of the village of the same name. It occurs also in this, in the state of sulphate and sulphuret.

These veins of copper are followed in galleries cut horizontally into the heart of Snowdon, passing through hard basalt and slaty hornblende, which form the walls of the veins. The matrix of the copper is quartz. From the irresistible nature of the enclosing rocks, much gunpowder is required. When the metal is thus raised, it is broken with hammers into small pieces, and, by means of a stamping-mill, moved by water, which is brought nearly a mile in a wooden aqueduct, it is reduced into a fine powder, and well washed. The metallic copper-ore thus prepared is packed up in bags, and is put on board small boats, sent down the two lakes, and afterwards carted to Carnarvon, whence it is exported to the founderies at Swansea.

Somewhat connected with the last described metal, we find on the south bank of the Ogwen, above a mile from Dolawen slate-quarry, and more than seven from Bangor, the arseniate of copper. It is included between hard rocks of slate. It was not long ago that it was raised, roasted, and by process of sublimation pure oxide of arsenic was obtained. But the preparation requiring much chemical skill, was not properly conducted, and it has lately been abandoned.

There remains only to be considered, iron, manganese, lead, and calamine, all which are found in this side of the Menai basin, but in very inconsiderable quantities, and hardly deserving observation.

In the secondary rock along the Carnarvon side of the

Menai Strait, within two miles of Carnarvon, and to the north of that town, some small beds of iron are observed. As yet they have been applied to no useful purpose. It is probable, from occasional springs now and then met with of chalybeate waters, issuing from the Snowdon chain, that small beds of iron exist, imbedded in the transition-rocks. Manganese occurs in a thin vein, in Alt Dhu slate-quarry. Being mixed up with oil, it forms a tolerable brown paint. At Dolawen and Alt Dhu, in a sparry quartzy vein which crosses those slate-quarries, occasional traces of galena, or sulphuret of lead, are observed. Near Capel Curig, about twelve miles from Bangor, on the Holyhead road, calamine, or carbonate of zinc, occurs. It is sent to Trefriew, and then shipped off for the founderies at Bristol.

Though the coal measures shew themselves on the Carnarvon side of the Menai basin, no workable seam has hitherto been discovered. Peat is not found in any considerable quantity, the nature of the rocks, the sudden slopes of their declivities, and the hollows being generally filled with watering to a great depth, preventing the formation of this article of fuel, which would be so useful in a country devoid of workable coal. It may be mentioned, that, from the scarcity of wood, peat is employed to heat the oven for baking fermented wheaten and barley bread. The smoke of the peat being consumed in the process of combustion, no smell or offensive taste is given the bread thus baked.

MENAI BASIN, ANGLESEA.

Having taken a rapid survey of the more striking vegetable and mineralogical productions of the Carnarvon portion of the Menai basin, we shall now cross over the strait of the Menai, and endeavour to take an equally rapid survey of those of the Anglesea side of the basin.

Even the most superficial observer cannot fail to notice several discriminating differences between this and the side we have just quitted. The rocks are, for the most part, of the same general nature, viz. of the transition formation, and are slaty in their structure, but less vertical, and much lower, rising only to the north-west and east end of the island, forming a barrier to the violence of the ocean; but not of sufficient altitude altogether to prevent the influence of the west and south-west gales. The streams generally shape their course to the south-west, and never attain to any magnitude. The scenery is far less interesting than that of the other side of the basin. Though the surface of the island presents slight elevations, and occasionally affords pleasing scenes, it is wholly without those bold, grand, romantic features which delight the beholder of the Carnarvon side of the Menai Strait. What gives the greatest interest to Anglesea, is its being the best station whence the long extending peaked outline of the Snowdon chain can be commanded, and taken in by the eye.

As Anglesea contains rocks of the siliceous, calcareous, and argillaceous classes, and as soil is made up of a greater or less portion of these rocks, in combination with animal and vegetable matters, much of a good quality is met with in this island. The rocks belonging to the transition formation found here, yield with much more readiness to decomposition than those of the Carnarvon side of the Menai basin, and consequently afford in abundance materials for the formation of soil; and the island of Anglesea being without great mountains to produce steep declivities, the particles of soil soon and readily accumulate.

Along the banks of the Anglesea side of the Menai Strait, around Llanidan, which faces Llanfair, two miles to north of Carnarvon, is the deepest and richest soil. It is of a reddish colour. But the greater part of this island is of a lighter soil, which consists of a sandy loam, mixed with small rounded pebbles.

In the great marsh of Maltraith (now drained), in the southern corner of this island, near Newborough, containing 3000 acres, a great body of peat is accumulated.

The principal rivers are the Llinon, the Alaw, the Wina, the Ceint, the Breint, the Torryd, and the Dulas. But since Anglesea is a county generally with a gently undulating surface, having few mountains, and those not lofty, the banks of the streams do not abound in wild, wooded, romantic scenery.

I have already noticed that, though the mountains of Anglesea, on the north-west, protect it from the violence of the sea, yet they are not sufficiently elevated to moderate the fury of the gales which blow so frequently from that quarter; and as there is a great scarcity of timber, and few fences of the hedge-plants, these winds sweep with irresistible impetuosity over the island.

Notwithstanding the destructive effects of these storms, the climate of this island appears, on the whole, favourable to health, and we find people attaining an advanced age in several parts of it. The only exception to this was the great marsh of Maltraith, situate on the southern shore of Anglesea; the exhalations from it occasioned feverish agues, but since it has been drained that disease is less prevalent. Wherever shelter can be obtained from the south-westerly gale, as along the shores of the Menai, particularly to the south of Beaumaris, and in some of the gardens of that town, not a few of the less hardy plants, as the myrtle and hydrangia, live and thrive.

The nature of the rocks, composed partly of a soft asbestine slate, yielding readily to decomposition, of calcareous and argillaceous matter, produce a soil well fitted for the growth of grass and grain crops; and from time immemorial the island of Anglesea has been considered the granary of North Wales.

In the south, west, and east ends of the island, the land being of a stronger loamy composition, heavy crops of wheat are raised. But that grain is cultivated in other parts too extensively, and often on soils too light, to bring it to perfection.

The soil of the island may be considered generally better adapted for the turnip course of husbandry, alternating with crops of oats and barley. Though the soil, however, be well calculated for the production of the turnip, little is raised. And the manure of the farm, for the most part, is given to the potato, which is here cultivated extensively.

More attention is paid, in Anglesea, to upland meadow-land, than in the Carnarvon side of the Menai basin. The island abounding in calcareous matters, as shell-sand, marl, or limestone, one or other of these is used for top-dressing; and the beneficial effects of such management is seen in the thriving stock of all kinds.

The same facilities for meadow-irrigation do not exist on this, as on the Carnarvon side. The streams, in Anglesea, descending in their course from lands little elevated, the supply of water for the flooding of grass-lands is very limited; still, however, the employment of water, where it can be readily obtained, ought not to be overlooked in this island, in augmenting the supplies of food for the cattle and sheep, by means of irrigation.

Not as on the Carnarvon side, where the sheep and cattle are diminutive and ill fed, we find in Anglesea these animals attaining to great size and weight.

Great numbers of cattle are bred for and exported to the English markets. It is said that the number of 8000 head are annually sent away. The sheep are also numerous. They are of such a size as, at two or three years old, to average from 10 to 16 ℔ the quarter; and when clipped, which happens twice annually, to prevent the scab, as is imagined, they yield from $1\frac{3}{4}$ to $2\frac{1}{2}$ ℔ of wool. As many of these animals as 7000 are annually driven to England. So indifferent are the fences of this island generally, that it is a common practice to fasten the fore and hind legs of these sheep, on each side together, with a straw-band, to prevent them leaping the fences. This custom, indeed, is almost universally adopted in North Wales with the sheep, which are as nimble as deer, and, when no way fettered, will clear any ordinary wall.

Anglesea appears to have been formerly covered with wood. According to Tacitus*, when the Roman general Suetonius Paulinus invaded it, to destroy the Druidical superstition, it was covered with forests of oak. It is also said that the King of Man was supplied with ship-timber from this island. But the increase of population, and the extension of cultivation, have effaced all traces of these ancient tracts of forest-land.

Along the shores of the Menai Strait, between Beaumaris and Llanidan, protected by a slight ridge rising to the west, from the south-west gales, wood of all kinds grows well. In every other place it is rarely met with.

Anglesea, from the variety of the rocks of the transition and secondary classes, opens a wide and interesting field for the mineralogist, and particularly as it contains one of the largest metallic deposites in Great Britain.

Though Anglesea does not possess, like the Carnarvon side of the basin, from the softer character of its component rocks, slate sufficiently durable for roofing, it is compensated for by other mineral productions of equal or greater value.

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* —"Excisique luci, sævis superstitionibus sacri."

The prevailing rock of the island seems to be the green asbestine slate. Good sections of it are exposed to view by the road cut along the shore of the Menai Strait, between the Iron Suspension-bridge and Beaumaris. It is here penetrated, from east to west, by frequent narrow veins of basalt.

Two or three great veins of porphyry, steatite, and hornblende, can be traced across the island, taking the direction of east and west. Two of these are well seen to south of Amlooch, and within a mile of that town.

Near Llanerchymead granite occurs, the only place in the Menai basin where it is observed.

Of the secondary rocks we find a great number in the island of Anglesea.

This class, important for the builder and agriculturist, is pretty generally diffused through the island. The limestone first appears on the eastern shore, at Red Wharf Bay, where it occurs in great strata, and appears to be the carboniferous limestone that underlies the coal measures. In order properly to distinguish it from a reddish variety occurring at Plas Newydd, we shall call it the upper, and the other the under, and above these two will be found the coal measures. It ranges from this place northwards along the coast, with more or less interruption, to Cemaes, the most northerly point of Anglesea. In some places, however, along this line of shore it is not seen. It overlies the green asbestine slate. From Red Wharf Bay, beds or veins of this limestone are often observed, pushing themselves through this slate rock, a considerable distance into the interior, as seen from Lluguy to Llanfinnan and Llangefne. To the south-east of Red Wharf Bay, this limestone is found at Penmon, nearly opposite to Penmaen

Maur. And along the Menai Strait, as at Plas Newydd and Llanidan, a reddish dun-coloured limestone, which we have named the Under, appears, which seems to be the mountain limestone that underlies the upper formation of the limestone of Red Wharf Bay. At Plas Newydd, three miles to the south of the Iron Suspension-bridge over the Menai, the under limestone, containing a quantity of the oxide of iron in its composition, makes a good water-cement, not unlike Terras limestone. Some kinds of the upper limestone, near Red Wharf Bay, are so hard, that they are polished, and worked into ornamental slabs. Such a kind occurs at Llangwyfan.

Under this upper limestone of Red Wharf Bay rest various strata of different coloured sandstones. The finest for building is found on the southern side of Anglesea.

As connected with the calcareous formation, great abundance of shell-sand is found on the coasts of Anglesea. That which is richest is brought from Red Wharf Bay, in the north-east side of the island. It contains from two-thirds to four-fifths of decayed shells. The mussel is the most abundant shell, but the smaller cockle is also mixed up with the sand.

Marl is found in considerable abundance in Anglesea, and is of three sorts; the red, grey, and white. The white, when applied in too large quantities to tillage lands, is considered to be hurtful. The white occurs at Llanddyfnan. When marl is burned, like lime, it is found here, when applied as top-dressing to grass, to bring up grasses not seen before in the ground, as the white honeysuckle-grass, the red meadow-trefoil, and the tufted vetch; and it augments greatly the cut of hay. While describing marl as a manure employed in husbandry in Anglesea, we cannot omit mentioning, that, on many parts of the shores of this island, the larger Fuci are found pretty abundantly, and are similarly used. Before the manufacture of the Scotch kelp, a much superior article in the arts, the sea-weeds of Anglesea were burned and prepared for market.

Coal is found in Anglesea, though not abundantly. It fills a small narrow basin, crossing the island from south-west to north-east, which seldom exceeds four miles in breadth. It is found to the north of the river Ceint, and between it and the river Breint. It ranges from the mouth of the Maltraith Marsh to Red Wharf Bay, and appears to be deposited upon the limestone of the latter place. The strata at the sides of this coal basin are sometimes observed to lie edgeways, or perpendicularly inclined, to the horizon. The interior of this basin to a considerable distance is overlaid with a thick peat covering, forming Maltraith Marsh.

The strata that is sunk through in arriving at the coal, are the following:—

1. Sand, ...	5 feet.
2. Sandstone, . . .	66
3. Black shale, . .	6
4. Good coal, . . .	3½
5. Indurated clay, .	2
6. Sandstone, to a great unknown depth.	

In all the pits the workmen suffer much from water, which would require more powerful engines than they now employ, to keep the working free of it.

The most valuable, however, of all the productions of Anglesea are its mines of copper. They exist in the Paris Mountain, which is divided between two proprietors. The Marquis of Anglesea possesses the Mona mine, Colonel Hughes the Paris; but they form only one mine, being contiguous to each other. They were discovered in 1768, and have ever since been wrought.

The copper is enclosed between a hard blackish coloured slaty quartzy rock. It is not raised here, as in other places, by mining, shafts, and levels, but is quarried out, so as to leave a great open excavation.

The ores found are, the sulphuret of copper, the malachite or green and blue carbonate of copper, native copper in small quantities, and sulphate of copper.

The first operation in preparing the metal is, to roast the sulphuret of copper in kilns constructed for the purpose; and, by condensing the fumes, sulphur is collected in great quantities. It requires six months to complete this operation. The sulphur taken out of the chambers where it has been condensed, is melted, cast into moulds, and then sent off to the manufactories of gunpowder.

During the action of roasting, the copper-ore, in the state of the bisulphuret of copper, loses an atom of its sulphur, and becomes the protosulphuret, or, as the workmen call it, the regule. It gathers from all parts, of any given lump of ore, into a sort of nucleus, its particles, of course, having actually changed their place. This may be considered as rather a remarkable fact, that, at a heat below fluidity, the particles of the metal diffused through the rocky substance should change their place.

The purest copper-ore, however, is the sulphate, containing 50 per cent. of pure metal. It is found in solution at the bottom of the mine, and is obtained by precipitating the metal from a solution of sulphate of copper by means of iron.

From the exhaustion of the rich copper-ore in the Paris Mountain mine, recourse is now had to extract that metal from much of the ore which used formerly to be thrown away. This waste copper-ore is the protosulphuret of copper, containing a large portion of sulphuret of iron, which, from the affinity of the latter for sulphur, it becomes a difficult and expensive operation to separate. But an ingenious gentleman, Mr Joseph Jones of Amlooch, has discovered a way to accomplish, at little expense, the separation of the two metals. To separate it from this very poor ore of protosulphuret of copper, or from a slag, he adds a further quantity of protosulphuret, or some substance containing it, and thereby gets out not only the portion added, but the small quantity not obtainable by common means. This operation of separation of copper from poor ores requires four smeltings before it is accomplished. The sulphur is last burnt off, by throwing wood into the melted sulphuret of copper, and in this way pure copper is obtained.

The greatest depth of the mine is about 300 feet. The excavation has much the appearance of an egg-form, and corresponds to the idea which the celebrated Werner threw out several years ago, that metallic deposites often are found collected into masses of an egg-like figure.

Not many years ago 1500 men were employed in the Paris Mountain copper-mines. But now so much have they declined, that perhaps scarcely 500 men find employment.

In 1799, these mines, at an average, annually produced 30,000 tons of copper-ore; now, perhaps, not a sixth of that quantity. The mine seems now nearly exhausted.

Occasionally sulphate of lead and calamine are found mixed with the copper-ore of Paris Mountain.

CARDIGAN BAY BASIN.

Having, as briefly as we could, pointed out some of the interesting peculiarities of the Menai Basin, as respects its general appearance, productions, animal, vegetable, and mineral, we now propose to hasten into the third, and remaining basin, that of Cardigan Bay, which we observed, from the summit of Snowdon, to stretch toward the south-west; and, in order to enter it, we must cross over the south-west extremity of the Snowdon chain, by a pass two miles to the east of the Rivels, which, it will be recollected, are the termination of it to the south-west. In entering the Cardigan Bay Basin, we shall find, from the small portion occupied by the Carnarvon side of it, that little will remain for us to make the subject of observation; as we shall find, in proceeding to the north-east end of the Carnarvonshire portion of the basin, which is formed by the hardest kinds of the slaty transition rock, that many of the remarks we made elsewhere on the effects they produce, are quite applicable here. The south-west end of this side of the basin alone will require some little attention in its examination.

The basin of Cardigan Bay, being much covered in its interior with the sea, the extent of land making up the remainder is necessarily limited. On its northern side, we have that portion of Carnarvonshire lying to the south of the Snowdon range; on the east, a small range of mountains connecting the Snowdon chain with that of the Berwyn; on the south, the Berwyn chain, a parallel one to that of Snowdon, commencing at Chirk Castle, in Denbighshire, and terminating at Sarny Booch, about ten miles to the south of Barmouth. They observe the same direction as the Snowdon chain, viz. from south-west to north-east, and extend fifty-four miles in length; and, lastly, on the west, the basin opens into St George's Channel.

That we may more readily describe this portion of the Cardigan Bay Basin, we shall employ the names of Efionydd and Lleyn, which have been given to the two districts into which this part of Carnarvonshire has been divided. The district of Lleyn occupies the south-western end, and that of Evionydd the remainder, or north-east portion.

Evionydd, at its eastern end, is enclosed by the southern front of the Snowdon chain; and from the hard, indestructible character of the rocks in this direction, the country is wild, rugged, and rocky. The surface is rendered uneven by frequent small hills; and in addition to these inequalities, it is often strewed with great boulders covering the ground.

Lleyn presents characters very different. Being enclosed on the north-west by a low ridge of hills, a branch of the Rivels, or western extremity of the Snowdon range, is open to the sea on the south-west. As the rocks are decomposable, a great portion of this district is covered with good soil; and the surface, less broken into inequalities, and with little or no obstruction from the rocks lying on the ground, is well adapted for tillage.

The rivers which flow into Cardigan Bay from the Carnarvonshire side of the basin, are, with one or two exceptions, (though numerous, small streams, descend from the higher grounds), of no great magnitude.

The principal are the Llanystunduy, and the Glassin or Colwyn.

The first enters the bay two miles to the south-west of Criccaeth Castle. Its banks are richly clothed in fine oak-timber.

The other, the Glassin, after a course of above twelve miles, pours its waters into Traeth Maur marsh, and there joins the sea. Few rivers in North Wales afford more interesting grand scenery than this. It takes its rise out of the Lake of Gwynant, which adorns the southern face of Snowdon; next passes through another lake, Dinos, and, after tumbling over a ledge of rocks twelve feet high, forming the celebrated Salmon-leap of Pont Aberglassin, finishes its course at the Traeth Maur marsh.

Nothing can be more opposite in appearance than the districts of Evionydd and Lleyn. The latter presents a surface broken into gentle inequalities, the hills that bound it to the north being low, and with easy sloping sides, generally clothed in vegetation, and along the shores of Cardigan Bay, towards Bardsey Island, distant a mile from the shore to the south-west, affording sweet beautiful scenery. On the contrary, Evionydd is enclosed on the north and east by the lofty Snowdon chain, having their declivities almost perpendicular, rough, rugged and craggy; and, though clothed in many places with beautiful copse-wood and thriving plantations, the general character of its scenery is bold, and highly romantic.

What we have observed elsewhere, while considering the character of the soil as depending upon the nature of the rocks, whether it be good or bad, scanty or abundant, worthless or productive, is applicable, in considering this subject, in the districts of Llyen and Evionydd.

Accordingly we find in Lleyn, where the rocks are of a soft and yielding transition-slate, that the soil is occasionally loam, but oftener of a light, argillaceous, sandy, and gravelly composition. In Evionydd, again, from the undecomposing rocks upon which it rests, the soil is scanty, light, gravelly, with little argillaceous matter to give it adhesiveness.

Not being so much exposed to the south-west winds as the Menai basin, the climate is on the whole milder. At

Poolhelly, a small neat town on the sea-shore of Cardigan Bay, the climate is particularly salubrious, and is much resorted to by invalids for sea-bathing.

The more delicate plants, as hydrangia, the myrtle, the mulberry, the arbutus, and the sweet-scented bay, grow in great luxuriance in the vicinity of this place.

The difference in the agriculture of these two districts varies in consequence of the different composition and nature of the soil which constitutes each.

In Lleyn all the varieties of the grain crops are successfully raised. Though there are situations which yield wheat, yet barley and oats are more suitable for the soil. A great observable resemblance in soil is apparent between Lleyn and parts of Anglesea.

The turnip husbandry, though introduced by some of the land-owners, has not yet extended itself over much of the district. Lleyn, not abounding in limestone or marl, like Anglesea, is necessarily subjected to more expense in top-dressing grass lands; and from that circumstance, it is more necessary that the many rivulets, crossing it in all directions, should be turned to irrigate their meadows; and, though their stock of all kinds is reputed the best in Carnarvonshire, it might by this means, not only be raised to greater size, but augmented in number, by means of irrigation.

In Evionydd cultivation is much contracted, by the unproductive nature of the soil. We here see raised all the grain crops, but far from being brought to perfection.

The cattle resemble in all respects, though not quite so large, those of Anglesea; and sheep are larger in size, and better formed, than those we described as bred on the Carnarvon side of the Menai basin. Above 5000 black cattle are annually sent to England from these two districts of Evionydd and Lleyn.

wood on the Merioneth side of the basin. But in the beautiful little basin formed by the Mauddach, between Dolgelly and Barmouth, the shores are adorned with rich natural copse-wood; and among it the larch has been planted, and is thriving most luxuriantly.

On the Carnarvon side of the Cardigan basin no workable slate is found. At the north-east, as we approach the south front of Snowdon, where the rocks are similar to those found on the side of the Menai basin, hornblende, porphyry, basalt, quartz, asbestine slate, and hard clay-slate, occur. No limestone or marl have yet been discovered in the Carnarvonshire side of Cardigan Bay basin. In this quarter are several veins of copper. The only one that is wrought is on the banks of the Glassin, three miles to the east of Bethgelest. Copper was within these few years extensively raised in a mine close to Pont Aberglassin; and about three miles to the south-west of Tremadoc, copper is also found, but not wrought. As we approach the south-west, or district of Lleyn, where the softer rocks abound, copper is no longer seen; but in a hard rock, called Penryn Du, adjoining St Tudwal's Islands, to the south of Poolhelly, lead occurs. This mine belongs to the Marquis of Anglesea; and has, in one year, yielded considerably more than 1000 tons of lead. It is found in a state of galena, or sulphuret.

In addition to the mineral products of this basin, the ocean yields a rich treasure in its fish. A great variety of the best kinds of flat, and other sorts, are caught, and brought to market. In their season, great shoals of herrings and mackarel visit the Bay, and plenty of salmon is also taken.

As we remarked, before leaving the basin of Conway, that, in addition to the beauty of its scenery, and the variety of its productions, it could boast of much in the way of architectural interest, and, though not strictly connected with a geological paper, we could not pass it over. If we indulged ourselves on that occasion in slightly enumerating a few of the more remarkable buildings, we propose in the same manner, before leaving the basins of Cardigan Bay and of the Menai, to notice any thing that seems interesting in the way of ancient and modern architecture.

The same Edward I. who left at Conway a memorial of his ambitious designs, in the castle he erected to facilitate his inroads into the counties of Carnarvon and Merioneth, with the same views, and to retain possession of these districts, built the castles of Harlech, Criccaeth, Carnarvon, and Beaumaris. Of these, Carnarvon stands unrivalled, in magnitude and beauty of architecture. While examining this ancient pile, nowhere can the mineralogist have a better opportunity of studying the variety of rocks with which these districts abound; for he will perceive that almost every kind of rock of the country has been laid under contribution to construct the walls of this castle. Of later architecture, though not castellated, but of great antiquity, are the ancient houses of Corsegeddar Plas Hen and Coitmore. And no less interesting is the remarkable church of Clynog, a model of the best style of Gothic architecture, and formerly the Loretto of North Wales, being the shrine of St Beuno. And, as the works of present times, we cannot omit the two wonderful Iron Suspension Bridges, the one over the Menai Strait, and the other over the mouth of the Conway. But the latter, though a stupendous work, yet, when contrasted with that over the Menai, sinks into insignificance.

The Menai Iron Bridge has been so often described, and is so well known, that it is unnecessary to enlarge upon it. Suffice it to say, it is 100 feet above high-water-mark; and the length of the chain, which crosses the Strait, is 1714 feet. It was constructed by Mr Telford, whose name deserves to be handed down to posterity, rather than that of Edward I.;—so much more ought fame to be perpetuated by useful works, than by ambition.

Having thus gone over regularly the three basins, which we observed from the summit of Snowdon, and in a hasty manner observed what of interest each contained, we cannot have failed of discovering considerable varieties in each.

In Conway Basin we found the mountains on the west side lofty, conically peaked in their outline, their sides rugged and steep, particularly to the southern end of the basin; and we also observed, according as the rock was of a harder texture, the slate to be more fitted for useful purposes. In the same way, likewise, according as the rock yielded to the weather, more or less soil was found on the declivities of the mountains, affording mould for the growth of vegetation and trees. In proceeding from the southern end of this basin, all this was pointed out; and as we approached the town of Conway, where the accumulation of soil was greater over the slopes, we there found abundant soil, rich vegetation, no scarcity of timber, and plenty of depth of mould for the working of the plough.

No copper is wrought in the basin of Conway, except at Llandudno, in Orme's Head; but lead is rather extensively wrought. The Conway river being navigable a third of its course, thereby affords an easy means of transport for the productions of the basin,—and was found that the whole of the basin was copiously supplied with numerous streams of water, well fitted for irrigation, or for moving machinery; and the number of small lakes along the base of the Snowdon range, demonstrated the difficult decomposition of the rocks, and gave a characteristic feature to this side of the basin. At the northern extremity, as at Orme's Head, we saw that there was a great store of limestone; and that though there was no coal, peat was found in several places; that, near Conway, a mile to the south-west, chirt, and a sort of stone resembling French buhr-stone, was found.

That the larch, in the upper portions of the basin, was found to grow well; and the Spanish chesnut at Gwydir.

In the basin of the Menai we found the sides of the Snowdon chain much steeper, more rugged, and more rocky, than those of the Conway basin; that, consequently, there was less vegetation, and that, from exposure to the violence of the south-west storms, even in places where there was soil, trees did not grow;—that the soil formed out of these hard undecaying rocks was generally poor, light, gravelly, with little argillaceous matters to give it adhesion;—that several rivers issued from this side of the range, and though some larger lakes were found along and among these mountains, yet that they did not equal in number those on the other side.

That the best and most workable slate, enclosed in veins between the harder transition rocks, was found in this basin, and was the great source of wealth to the Carnarvon portion of it. That copper was also raised in considerable quantities in several places, but that the best and richest was found only in the hardest of the slate transition rocks.

That arsenic was found; but very slight traces of lead; of calamine more abundantly.

Along the shores of the Menai Strait most of the secondary rocks were met with, limestone, and marl; but no coal. Peat was rather generally diffused, though in no great quantities.

That the cattle, and particularly the sheep, were small, and ill-fed; that the cultivation consequently was not the best.

Too much of the potato raised, and too little of the turnip. And scarcely any attention given to direct the streams by irrigation over their grass-lands.

In the Anglesea portion of the Menai Basin we met with some striking contrasts to that of the Carnarvon side. In Anglesea, the great body of rocks, being of a softer, more yielding transition-slate, afforded soil in abundance; and we therefore had a richer vegetation, better grain crops, a larger and heavier breed of cattle and sheep.

That, though the climate of the whole basin of the Menai be subject to frequent gales from the south-west, yet it is far from being a cold climate. In winter, the contiguity of the sea moderates the cold, and from that cause very seldom is an intense frost experienced. Wherever shelter can be afforded, we found that many delicate plants would live and thrive well. And the longevity of the people, in almost all parts of the basin, proved the general salubrity of the climate.

That in Anglesea we had one of the primitive rocks, granite; and most of those of the transition; and had even many of the secondary, accompanied by an upper and lower strata of limestone,—the one, the lowest, the mountain,—the other, the upper, the carboniferous; and over these we had workable beds of coal. Peat also we observed to abound in Anglesea, and marl of all kinds.

But the most valuable of all the mineral productions, as no workable slate was found, was copper, which for many years was a great source of wealth to the proprietors, and of employment for the miners.

That the shores of this island yielded the Alga marina, which, before the Scotch kelp was used, was burned and prepared for market.

After passing into the basin of Cardigan Bay, we had those observations relating to the effects of hardness of rock upon soil, vegetation, and animals, still further confirmed. In Lleyn, on the south-west portion of the Carnarvonshire side of the basin, we found the slate transition rocks so soft and so decomposable, as to yield an abundant and productive mould. At the other extremity of the basin, on the same side as in the district of Evionydd, on the contrary, from the rocks partaking of the same characters as those on the Carnarvon side of the Menai Basin, we had a poor, meagre, gravelly soil; vegetation scanty on the declivities of the mountains;—and that, from the good soil of the south-west end, or district of Lleyn, the cattle and sheep were nearly as good as those in Anglesea; that the rearing of swine in great numbers for the English market was peculiar to this part of Carnarvonshire.

That no workable slate was found in this side of Cardigan Bay basin; that lead was found only at the south-west end of the Carnarvon side of the basin; and that copper abounded in the hard rocks of the north-east extremity.

That the whole Bay of Cardigan abounded in fish of all sorts; shoals of mackerel, and herring in their season; flat fish, turbot and sole, crab and lobster.

On the Merioneth side of the Cardigan Bay basin, we had it bounded to the south by a chain of mountains called the Berwyn, parallel to that of Snowdon, and stretching from south-west to north-east. That these mountains, though composed of transition slate, were much less vertical in their strata, less peaked in their outline, and their rocks, yielding more readily to the action of the weather, produced more soil for plants than the Snowdon chain; accordingly we found them more covered with alpine plants and grasses.

That copper was much rarer than lead in this range;

that on their sides, and sometimes penetrating them in the form of veins, an argillaceous limestone was often seen, which was burned and applied to agricultural purposes.

That no coal had been found, but abundance of peat along the shores of the Bay of Cardigan; and that the best was inundated by the sea, but left bare at low water.

That the ocean had made great encroachments on the coast of Merionethshire, as proved by that great stretch of embankment at Larn Badrig.

Though at first sight this might appear a country fitted only to delight the lover of romantic scenery, yet we have found, in the short and hasty sketch which we have given, that few parts of the empire, of the same extent, contribute more to the common stock. Anglesea, as we have seen, besides the abundant agricultural produce it affords, has long supplied great stores of one of the metals most useful in the various arts. And Carnarvon, if we estimate the whole of its produce, will not suffer by a comparison with the best cultivated districts of England.

Few districts can perhaps be more fitted to shew how much every part of a country is influenced by the state of manners and modes of life, than the one we have just endeavoured to describe.

If it be viewed as when under the dominion of the Britons, we find it covered with forests, which afforded a shelter to the dark and bloody superstition of the Druids. The means of subsistence for man must have been limited and precarious; and no advantage seems to have been taken of the valuable internal resources which Nature has so amply provided for supplying the wants of the inhabitants. The principal remains that exist as indications of the state of the arts among this rude people, are the Druidical circles of stones to be seen in many places, but more particularly in Anglesea, where they performed their cruel religious rites, offering, as we are told, human victims on their altars *.

Such appears to have been the state of North Wales when invaded by the Romans, under whom this district must soon have assumed a different appearance. And though they substituted their own Pagan forms of worship, yet being free from human sacrifices, it was better calculated to soften and civilize the native Briton, accustomed, from the scenes of blood he witnessed in the exercise of his superstitious services, to cruelty and bloodshed.

Besides ameliorating the manners and feelings of the natives, the Romans introduced agriculture, and the arts that contribute to the happiness and comforts of life; and there appears to be little doubt that the seats of some of the useful metals were not only known to them, but that the ores were raised and prepared for use.

The country was also in a great measure cleared of its forests; lands were brought into cultivation; roads were formed, to communicate between the different military stations; and towns, to secure their conquests. By these means a savage and unproductive waste assumed a civilized, cultivated, and smiling aspect.

It is probable that, after these foreign invaders had quitted this country, the inhabitants would never relapse into their former barbarous condition; and though not making for many ages much progress in the improvements and comforts of life, yet would never become what they once were.

There is every reason, however, to believe, that, long before the invasion of Edward I., their frequent struggles with the English princes must have taught them some of

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* —"Nam cruore captivo adolere aras, et hominum fibris consulere deos fas habebant."—TACITUS.

their improved modes of life. From the resistance they offered to Edward I., numerous forts and castles were erected by that sovereign in various parts of this district, so that it assumed the appearance of a province of England, kept down by an armed force. In this state it continued, until it was gradually assimilated to the kingdom to which it had been annexed.

As the arts of refinement made progress in the empire, it was found that this sequestered district could contribute in no small degree its share of materials for the general improvement of the nation at large; and as its mineral resources were brought into use for the general good, they tended gradually to change the face of the district itself. Instead of the impenetrable forests of the Druids, or the frowning castles of the conqueror, thriving and populous villages and towns have arisen in the neighbourhood of the mines with which this part of Wales abounds.

Some of the Grasses and Plants most common in the Pastures, most of them to be met with in both Counties of Carnarvon and Anglesea.

- Veronica officinalis
    - chamædrys
    - agrostis
    - arvensis
- Pinguicula vulgaris
- Anthoxanthum odoratum
- Valeriana locusta
- Eleocharis palustris
- Scirpus cæspitosus
- Eriophorum polystachion
    - angustifolium
    - vaginatum
- Nardus stricta
- Phalaris arundinacea
- Alopecurus pratensis
    - geniculatus
- Agrostis canina
    - vulgaris
    - alba
- Aira cæspitosa
    - flexuosa
    - præcox
    - caryophyllea
- Holcus lanatus
    - mollis
    - avenaceus

- Melica cœrulea
- Poa trivialis
  - pratensis
  - annua
- Triodia decumbens
- Briza media
- Dactylus glomerata
- Cynosurus cristatus
- Festuca ovina
  - vivipara
  - duriuscula
  - bromoides
  - pratensis
- Bromus mollis
- Avena fatua
  - pubescens
  - flavescens
- Lolium perenne
- Triticum repens
  - caninum
- Scabiosa succisa
  - arvensis
- Sherardia arvensis
- Galium saxatile
  - verum
- Plantago major
  - lanceolata
  - maritima
  - coronopus
- Alchemilla arvensis
  - vulgaris
- Myosotis Scorpioides
- Primula vulgaris
  - veris
- Anagallis arvensis
- Campanula rotundifolia
- Jasione montana
- Viola canina
  - tricolor
- Chenopodium album
- Hydrocotyle vulgaris
- Bunium flexuosum
- Heracleum Sphondylium
- Chærophyllum sylvestre
- Narthecium ossifragum
- Junci, about 15 species
- Erica vulgaris
- Stellaria media
  - holostea
  - graminea
- Fragaria vesca
  - sterilis
- Tormentilla officinalis
- Caltha palustris
- Ajuga reptans
- Glechoma hederacea
- Betonica officinalis
- Thymus serpyllum
- Prunella vulgaris
- Rhinanthus Crista-Galli
- Euphrasia officinalis
- Radiola palustris
- Cardamine hirsuta
  - pratensis
- Polygala vulgaris
- Ononis arvensis
- Ulex europæus
  - nanus
- Vicia sativa
- Ornithopus perpusillus
- Trifolium repens
  - pratense
  - procumbens
  - minus
- Lotus corniculatus
- Medicago lupulina
- Leontodon Taraxacum
- Hieraceum Pilosella
- Tussilago Farfara
- Senecio vulgaris
- Bellis perennis
- Achillæa Millefolium
- Carex, about 30 species.

List of Snowdon Plants, by William Wilson *of Warrington, Esq. August* 1828.

PLANTÆ RARISSIMÆ.

Anthericum serotinum, near Twll Du.
Arabis hispida, Clogwyn Du'r Ardhu.
Saxifraga cæspitosa, near Twll Du.
Woodsia ilvensis, near Llyn y Cwn } Ferns.
Hyperborea, Clogwyn y Garnedd. } Ferns.
Cyathea (now Cistea) regia, Clogwyn Du'r Ardhu.

PLANTÆ FREQUENTIORES.

Saxifraga nivalis, Wyddva summit, and near Twll Du.
Cerastium latifolium, Clogwyn y Garacold.
Aspidium Lonchitis.
Serratula alpina.
Salix herbacea.
Epipactis orgifolia.
Orchis albida, near Llanberris, below Ffyanon Frech.
Juncus triglumis.
Sedum Fosterianum.
Saxifraga oppositifolia.
Juniperus nanus, Glyder Fawr.
Subularia aquatica, Lleyn Ogwen.
Isoetes lacustris, Ffyanon Frech.
Chara gracilis, Lleyn Idwal.
Alisma natans, between the lakes at Llanberris.
Lobelia Dortmanna, Llanberris Lakes, Lleyn Idwal.
Potentilla alpestris, Clogwyn y Garcold.
Asplenium viride, near Twll Du.
    septentrionale.
Epilobium alsinifolium, Cwm Gaseg, below Garned Llenelyn, and by Aber Waterfall.
Rubus saxatilis, near Twll Du, also at Fachwere.
Papaver Cambricum, near Llanberris.
Thalictrum minus, Clogwyn Du'r, Ardhu, and Twll Du.
———— alpinum, do., and near Twll Du.
Poa alpina, do., and Clogwyn y Garnedd.
— glauca, near Twll Du.
Epilobium angustifolium, by Lleyn y Cwm.
Carex rigida, Wyddfa summit.
——— atrata, below Ffynnon Frech.
Draba incana, do.
Galium boreale, do., and near Twll Du.
Arenaria verna, do. do.
Rosa villosa, near Llanberris.
Hieracium alpinum, near Lleyn y Cwm.

Asplenium septentrionale, Hyperborea, and Hieracium alpinum, are so excessively scarce in Carnarvonshire, indeed almost extinct, that there is little probability of obtaining them: they are more plentiful in Scotland. The first of these is found chiefly on Arthur's Seat.

The following are common on the mountains:—

Rhodiola rosea.
Saxifraga hirta, platypetala.
Silene acaulis.
Gnaphalium dioicum.
Saxifraga stellaris.
Trollius Europæus.
Asplenium trichomanes,
Cistea fragilis,
Polypodium Dryopteris,
——— Phegopteris,
Ferns.

Hieracium maculatum, near Twll Du.
Lycopodium alpinum.
——— selaginoides.
——— Selago.
Hymenophyllum Tunbridgense.
Vaccinium Vitis-Idæa.

Rubus Chamæmorus is hardly to be found in Carnarvonshire. It is said to be common upon the Berwyn mountains, on the peaty bogs near the summits.

XI.—*A Commentary on the Second Book of the Herbarium Amboinense.*

By Francis Hamilton, M. D.

(Read 22d January 1825.)

See Vol. V. p. 307, *et seq.*

CAP. I. II.

Caryophyllum Tomi secundi, p. 1. t. i.

In the Hortus Cliffortianus, Linnæus, in imitation of Tournefort, considered this as forming a peculiar genus, *Caryophyllus;* and in the Species Plantarum this kind obtained the specific name *aromaticus*, (Burm. Fl. Ind. 122); but it was erroneously placed in the class *Polyandria.* M. Jussieu (Gen. Plant. 360) gave it a proper situation next to the *Eugenia*, from which it is only distinguished by the more elongated form of the calyx; but this M. Lamarck seems to think sufficient to distinguish it from the *Eugenia* (Enc. Meth. ii. 712), pointing out, however, some errors in the generic character given by Linnæus, which, if it had been correct, would have made the distinction more necessary. Willdenow, following Thunberg, joins this genus with the *Eugenia*, and gives it the specific name *caryophyllata.* With equal propriety he might have called the apple-tree *Pyrus malata.* If we set aside the form of the calyx, as insufficient for distinguishing the genus *Caryo-*

phyllus, although adopted by the greatest luminaries of the science, it should be placed with the *Calyptranthes ;* for the petala fall off united, forming a little ball, which, as Rumphius expresses it, " ad unum latus vergit," leaving the stamina to form the flower.

The elder Burman is quite correct in the synonyma added in his observation. To the *Caryophyllus aromaticus* the younger Burman (l. c.) joins, as a variety, the *Caryophyllus Malabaricus* (as he calls it) of Plukenet (Phyt. t. 274, f. 2), which is the *Calyptranthes Jambolana* or *caryophyllifolia* of Willdenow.—See Commentary on the *Jambosa Ceramica* (H. A. i. 130), and *Jambolana* (H. A. i. 131), an error that escaped my notice in a former commentary.

RAVENSARA, p. 10.

Rumphius seems to have mistaken this for a kind of *Caryophyllum*, and gives an account from Dapper. Subsequent botanists have, however, ascertained that the plants have no affinity, and M. Sonnerat at first called it *Ravensara aromatica*, a name that should be retained, as far preferable to *Agatophyllum*, or *Agathophyllum*, which he afterwards adopted, although this has been followed by Jussieu (Gen. Plant. 471), Poiret (Enc. Meth. vi. 81), Willdenow (Sp. Pl. ii. 842), and Lamarck (Ill. Gen. t. 825); and although the latter (l. c. t. 404) had previously, by mistake, published a figure under the name *Evodia*, given to it by Gærtner (De Sem. ii. 100, t. 103, f. 2). But this could not be retained, as having been previously given by the younger Linnæus to a quite different genus.

CAP. III.

Caryophyllum regium, p. 10, t. 2.

Rumphius seems perfectly correct in considering this as a mere accidental variety, and not a different species. Accordingly M. Lamarck (Enc. Meth. ii. 712) calls it *Caryophyllus aromaticus β*; and various authors, who have treated of it, are mentioned by Burman in his observation.

CAP. IV.

Caryophyllum silvestre, p. 12, t. 3.

Burman, in the annexed observation, is totally wrong in referring this to the *Caryophyllus languescente vi aromaticus, Malabaricus, folio et fructu majori* of Plukenet (Phyt. t. 274, f. 2), which is the *Jambolana* of Rumphius (H. A. i. 181); while the *Caryophyllum silvestre*, from the form of the calyx, evidently belongs to the genus *Caryophyllus;* and from its inflorescence seems a distinct species, not noticed by late authors.

CAP. V, VI, VII.

Nux Myristica, p. 14, t. 4.

Rumphius here describes not only the most perfect and common *nutmeg* tree, which he calls *Nux Myristica fœmina;* but also several varieties, namely, *N. M. mas*, *N. M. Pala Bacambar*, *N. M. Pala Kendekende*, *N. M. Pentsjoere*, *N. M. Pala Radjia*, *N. M. Pala Hollanda*, and *N. M. Pala Domine.* The male and female plants of Rumphius are not, as M. Lamarck justly remarks (Enc. Meth.

iv. 384), male and female, in the proper sense understood by late botanists; for both produce fruit: but the female is the most common variety, with round kernels; while those of the *N. M. mas* are oblong, a mere accidental circumstance, arising from culture. Trees producing such nuts, as Rumphius observes, "raro occurrunt, et semper solæ ab aliis remotæ arboribus, videturque hæc species degenerata esse a vera *Nuce moschata*." The same seems evidently the case with the other kinds. "Præter binas hasce species *Nux aromatica* alias quoque habet varietates, et abortus, quæ autem non diversam constituunt speciem." In this sentence Rumphius uses the terms species and varieties in exactly the Linnean acceptation.

The names given to this plant by various nations are carefully detailed by Rumphius (16, 17), and the synonyma of the older botanists are enumerated by Burman in his observation (18). The tree was not, however, introduced into the modern systems of botany, until the younger Linnæus published an erroneous account of it, under the name of *Myristica officinalis,* by which he no doubt meant to describe the proper *nutmeg* tree; but there is reason to suspect from Gærtner (De Sem. i. 194, t. 141, f. 1), that the *Myristica officinalis* of Linnæus is in reality the next tree that Rumphius describes. M. Lamarck, therefore, properly calls the true *Nutmeg Myristica aromatica* (Enc. Meth. i. 385; Ill. Gen. t. 833, f. 1), erring only in having quoted the *M. officinalis* among the synonyma, and perhaps in having borrowed some parts of Gærtner's figure of the fruit,—such as his *g*, *f*, *h*, and *i*, which seem to be the *e*, *f*, *i* and *l* of M. Lamarck, and do not belong to the *M. aromatica.* Although, therefore, M. Poiret (Enc. Meth. Sup. iv. 34) may justly blame Willdenow, or rather Thunberg and Houttuyn, for useless innovation, in changing the name *officinalis* or *aromatica* into *moschata* and *fragrans,*

M. Lamarck's name *aromatica* stands on a different foundation, and should be preserved, although Willdenow has been followed by Roxburgh (Hort. Beng. 73), and Aiton (Hort. Kew. v. 419).

CAP. VIII.

Nux Myristica mas, p. 24, t. 5.

In a commentary on the Hortus Malabaricus (iv. 9) I have pointed out some errors, that have arisen from considering the *Panam Palca* as the same with this. I therefore think, that all the synonyma given in the observation by Burman, except that of Valentyn, must be rejected. I shall here give what appears to me to be the true synonyma of this plant, which I have seen in Malabar (Buchanan's Mysore, iii. 161), and which may be readily distinguished from the *Panem Palca*, by having a much smaller fruit, but that possessed of considerable aromatic and narcotic powers, as described by Rumphius.

Myristica officinalis, Gærtn. de Sem. i. 194, t. 41, f. 1, nescio an Linnæi filii ?

Myristica philippensis, Enc. Meth. iv. 387 ? Willd. Sp. Pl. iv. 870 ?

Nux Zeylanica, Moschatæ rotundæ similis, oblonga, Burm. Thes. Leyl. 172.

CAP. IX.

Palala secunda, p. 26, t. 6.
Palala Cotriman, p. 26.

Whether or not these are mere varieties, or distinct species, cannot be inferred from what Rumphius says; but there can be no doubt of their belonging to the genus

Myristica, and the first is by Willdenow (Sp. Pl. iv. 871), called *M. salicifolia*; but he would not appear to have seen specimens, and M. Poiret quotes Rumphius as the only authority (Enc. Meth. Sup. iv. 34).

On the hills near Goalpara, by the Brahmaputra river, I have found a species of *Myristica*, which, on account of the form of the mace, is nearly allied to this; but its leaves are much broader than the figure of Rumphius indicates. It may, however, be the *Cotriman*, and therefore I shall here describe it. The Bengalese call it *Jharaya amara.* I have not seen the flower.

Arbor altissima. Ramuli cicatricibus nodosi, non pubescentes. Folia alterna elliptica, utrinque acuta, integerrima, glabra, vix costata, venosa. Petiolus brevissimus, compressus, supra marginatus, glaber, non stipulaceus.

Pedunculus fructiferus e parte ramorum nudata racemosus, baccis instructus quinque s. sex pedicellatis, pendulis.

Bacca? supera, oblique obovata, compressa, sulco longitudinali e medio unius lateris, ad basin alterius inscripta, carnosa, glabra, unilocularis; matura sulco dehiscente leguminiformis. Receptaculum nullum. Semen ope arilli ad latus baccæ ubi sulcus deficit, adhærens, unicum, oblongum, utrinque obtusum, nucamentaceum, arillatum. Arillus inodorus, carnoso-coriaceus, croceus, monophyllus, bilamellosus, utrinque glaberrimus, semen undique obtegens. Integumenta tria: exterius membranaceum, politum, venosum, tenue, arcte ad medium adhærens; medium Naucus tenuis, fragilis, castaneus; interius membranaceo-crustaceum, subrufescens, ad nucleum arctissime adnatum, et intra ejus substantiam processibus internis alte demersum. Albumen semine conforme, carnosum, ruminatum, inodorum. Embryon minimum, ad unum albuminis latus, medium prope, situs.

This genus has a considerable affinity to the *Sterculia*, from which it differs in wanting stipulæ, and in a simple fruit. Still, however, it comes nearer to the *Sterculia* than it does to the *Laurus*.

CAP. X.

PALALA TERTIA *s.* TINGENS, p. 27, t. 7.

In the Encyclopedie Methodique (iv. 391) this is quoted with doubt for the *Myristica uviformis* of M. Lamarck, which he described from specimens sent by Sonnerat. Willdenow, who never saw any of the plants, without any hesitation joins it with the two next *Palalas*, to form a species, which he calls *M. microcarpa*, thus setting aside the name previously given by M. Lamarck.

PALALA QUARTA *s.* CANARIFORMIS *s.* DENTARIA, p. 27, t. 8.

This Willdenow calls (Sp. Pl. iv. 871) *Myristica microcarpa β*, considering it as a mere variety of the preceding, for which I see no good reason.

PALALA QUINTA *s.* GLOBULARIA, p. 28, t. 9.

In the Encyclopedie Methodique (iv. 388) this was referred with doubt to the *Myristica globularia* of M. Lamarck, described from specimens sent by Sonnerat. Willdenow without hesitation considers them as the same, and joins them, as variety *γ*, to the *M. microcarpa* (Sp. Pl. iv. 871), although I see no reason, at any rate, to doubt of M. Lamarck's accuracy, in having distinguished his *M. globularia* as a different species from his *M. uviformis.*

PALALA SEXTA, p. 28.

There can be no doubt of this also being a *Myristica*, although it has not yet been introduced into modern systems.

CAP. XI. XII. XIII.

Agallochum primarium *s.* Calambac, p. 29.
Agallochum secundarium *s.* Garo Coinamense, p. 34.

Rumphius had not seen the tree that produces either of these substances, and takes his account from the Chinese, who trade for this valuable production with Tonquin (Coinam), Cochin China, Chiampa, and Siam; for it is the produce of India beyond the Ganges. These merchants agree, that the *Calambac* and *Garo* are the produce of the same tree, and differ in the former being found in the trunk, forming large masses; while the *Garo* consists of the smaller pieces found in the branches and roots; for it is only some individual trees, which produce in the heart the odorous black substance called *Agallochum.* The Chinese, who gave the account to Rumphius, compared the tree to what he here calls *Mycrophyllum*, meaning the *Varinga parvifolia* (H. A. iii. 139); but this was a very rude comparison, depending chiefly on the size and form of the leaves, which are not unlike, and was abandoned by Rumphius (l. c. 141).

The names given to this plant, or rather to the substance produced by it in certain circumstances, may be found in the three chapters of Rumphius, and in the observation of Burman (p. 33); but, although Kæmpfer and Cunningham had mentioned some true particulars concerning the plant, nothing like a botanical account was given, until M. Lamarck (Enc. Meth. i.), gave a description of it from specimens and drawings sent by Sonnerat; for Linnæus, misled by Ray, had considered the worthless *Agallochum Amboinense* as the precious *Agallochum*, although he fortunately gave it another generic name, *Excæcaria*, more suited toits nature. M. Lamarck, however, is evidently in an error, in distinguishing the *A. præstantissimum* and *A. officinarum*, as two species, for the Chinese speak decidedly on both the *Calambac* and *Garo coinamense* being the produce of one tree. This is confirmed by the circumstance, that the Mogul kings of Delhi, the most powerful and splendid monarchs of the East, were supplied with this precious drug (and no doubt they had the best possible), from the eastern mountains of Camrupa, where it is called *Agal* or *Agar*, from whence the *Agallochum* of the ancients is no doubt derived. This tree I have found, and I have sent specimens to the India-House, as the *Agallochum officinarum*, being, no doubt, the tree procured from Sonnerat, as any one may be convinced by comparing M. Lamarck's description with mine. It is, however, by no means the *Agallochum secundarium malaccense* represented by Rumphius in the tenth plate of this volume, as I shall afterwards show.

Some ignorant European traders, from the resemblance of the name *Agal* to *Aquila*, *Aigle*, or *Eagle*, called the drug by these names in Portuguese, French, and English; and our botanists have preferred *Aquilaria*, a name derived from this absurd mistake, to the name *Agallochum*, known from the earliest times, and probably derived from *Agal*, the name of the tree, and *Lochun*, the brains. This was done under pretence of Linnæus having already bestowed *Agallochum* on the *Arbor excœcans* of Rumphius; but the great Swede seems to have had a suspicion that Ray was mistaken, and therefore only used *Agallochum* as a specific term, leaving it free to others to employ it as the generic name for the true plant, when it should be discovered. On this account I have preferred M. Lamarck's name, *Agallochum officinarum* to his *Aquilaria malaccensis*, or to the *Aquilaria Agallocha* of Roxburgh (Hort. Beng. 33), which is the same plant, and shall be here described.

Arboris excelsæ rami teretes, glabri; ramuli pubescentes. Folia alterna oblonga, basi acutiuscula, apice acuminata, margine cartilagineo piloso integerrima, pagina utraque glaberrima, venis transversis minute striata, uninervia. Petiolus brevissimus, pubescens, non stipulaceus.

Pedunculus communis infrafoliaceus, petiolo sæpius longior, aliquando vix ullus, apice dilatatus. Pedicelli septem s. octo brevissimi, uniflori, uno post alterum prodeunte, cicatrices totidem in apice dilatato pedunculi communis relinquentes. Bracteæ nullæ. Flores virides, odore hircine fœtidi.

Calyx turbinatus, persistens, decemstriatus, limbo quinquefido patens. Corolla nulla. Urceolus interior non coloratus, calycis fundo adnatus, apice erecto libero decem-lobus, laciniis emarginatis, æqualibus. Filamenta decem ex urceoli incisuris. Antheræ parvæ. Germen superum, clavatum, maximum, compressum, bisulcum. Stylus vix ullus. Stigma obtusum, sublacerum.

Capsula obovata, lignosa, compressa, bivalvis, valvis hinc planis, inde convexiusculis, medio septiferis. Septum valvis connexum, medio solubile. Semina solitaria. Funis umbilicalis ex apice septi enatus ad caudæ seminis basin descendens. Semen ovatum, nigrum, pilosum, utrinque mucronatum, testa fragili tenuissima tectum, caudatum. Cauda teres, carnosa, e basi seminis recte ad capsulæ fundum descendens. Albumen nullum. Cotyledones forma seminis carnosæ hermisphæricæ, hinc convexæ, inde planæ. Radicula recta, supera.

There can, I think, be little doubt, that the *Gyrinops Walla* of Gærtner (De Sem. ii. 276, t. 140, f. 6) belongs to the same genus, which has a considerable resemblance to the *Thymeliæ*, notwithstanding that its fruit opens by regular sutures, and contains more than one seed. On this account, it is more nearly allied to the *Samyda*, as mentioned by Jussieu (Gen. Plant. 479), and Lamarck (Enc. Meth. ii. 610), and as I have more fully explained in a commentary on the *Anavinga* (Hort. Mal. iv. 101). Of the circumstances that could induce my accurate friend Sir J. E. Smith, to doubt this affinity (Lin. Trans. xi. 230), and to refer it to the *Euphorbiæ*, I am quite ignorant.

AGALLOCHUM ITTHION s. SIMPLEX CHINENSIUM, p. 35.

This seems to be the produce of the same tree with the

preceding; but the substance called *Agal*, has not completely formed, and consists merely of dark odorous veins, intermixed with the white soft wood of the tree in its natural state; for, so far as I could learn, of 100 full-grown trees, not above one or two contain any of the drug.

AGALLOCHUM SOC CHINENSIUM, p. 35.

This seems to be a distinct species, with small round leaves, which, from the words, "quorum plurima simul juncta parvis insidunt petiolis," would, perhaps, appear to be pinnated, in which case the tree probably belongs to quite a different genus; but the words may not imply so much, and may merely refer to there being numerous small leaves on each twig.

AGALLOCHUM SECUNDARIUM MALAICENSE, p. 35, f. 10.

I have already noticed that M. Lamarck had erroneously quoted this plant for that sent to him by M. Sonnerat, and that therefore the specific name *Malaccensis*, was improperly given to this plant. This erroneous name and quotation led Willdenow (Sp. Pl. ii. 629), to join the *Aquilaria Malaccensis* with the *Aquilaria ovata* of Cavanilles, which he says is the *Agallochum secundarium* of Rumphius (H. A. ii. t. 10), without noticing that this venerable author describes at least two species under this name, and that the *A. malaicense*, which is figured in table 10, differs from the *A. coinamense* described by M. Lamarck, in having much larger leaves, with projecting transverse ribs, and in having four seeds in each fruit, the place of what, in the *A. secundarium Coinamense*, I have called a cauda, and M. Lamarck "un corps spongieux," being occupied in the *A. secundarium Malaicense* of Rumphius by a real seed. If, as Sir J. E. Smith alleges (Lin. Trans. xi. 230), the plant of Cavanilles be the same with that of

Dr Roxburgh, then, it no doubt is the same with that of Sonnerat; but then, it is not the plant figured by Rumphius (t. 10), so that, until farther investigated, the *Aquilaria ovata* of Willdenow seems a very doubtful species.

CAP. XIV.

AGALLOCHUM SPURIUM GARO TSJAMPACCA DICTUM, p. 40.

Rumphius conjectures, that the tree which produces this is in fact a species of *Tsjampaca* or *Michelia*, which, from what he says, seems very probable.

AGALLOCHUM ALBUM, p. 41.

Rumphius gives no account of the tree producing this valuable perfume, only he cautions us from confounding it with the *Lignum moschatum*, often called by the same name. He also cautions us against confounding with the *Agallochum*, the resinous substances produced by the *Arbor excæcans* (Herb. Amb. ii. 237, *Excæcaria Agallochum* L.) and by the *Ligularia* (Herb. Amb. iv. 88; *Euphorbia nereifolia* L.), both of which he afterwards describes at length.

CAP. XV.

LIGNUM MOSCHATUM PRIMUM,
LIGNUM MOSCHATUM SECUNDUM,
LIGNUM MOSCHATUM TERTIUM, } p. 41.

Rumphius having never seen the trees that produce these odorous woods, it is almost impossible to form any conjecture concerning them. When, however, he speaks of their use, he says, "plurimum adhibetur ad unguenta odorifera, quæ supra lapidem minuta conteruntur, et quibuscum corpus illinitur jucundi odoris gratia." Now, in Ava, I found, that the women, when dressing themselves after having washed, rubbed some odorous wood on a stone with water until it formed a pulp, with which they smeared their skins. The rich, on high occasions, used *Sandal* for this purpose; but the wood more commonly used is that called *Sa-nak-kha*, the *Limonia acidissima* of Linnæus, which has a pale colour, and perhaps, therefore, is the *Lignum moschatum primum*.

CAP. XVI.

Sandalum album et Citrinum Timorense, p. 42, t. 11.

Rumphius sets out by observing, that the *white* and *yellow sandal* are the produce of the same tree, which is true, not only of the *sandal* in the Indian Archipelago, which he describes, but also of that growing in Continental India. Concerning the latter, he remarks (p. 45), " in Malabræ ora in Balagatæ montibus *sandalum* quoque *album* reperitur;—puto autem pro *sandalo albo* haberi *lignum Sambaranæ* dictum, quod *sandalo* simillimum, sed durius est." This clearly points out that the *sandal* of Continental India, in the opinion of Rumphius, is different from that of Timor, as I have no doubt it is from that of which he has given the figure.

In the first place, the leaves of the continental *Sandal* are simple; while, to judge from the figure in Rumphius, those of the insular kind are pinnated; for there is no instance of any plant with simple opposite lateral leaves, and a terminal one solitary, as represented in the figure. That the leaves in the insular kind are pinnated, is farther confirmed by the account given by Valentyn, as quoted in Burman's Observation (p. 47), " diciturque *Fraxino* similis." Besides, Rumphius says (p. 43), " quum folia incipiant flavescere, ac cum plurimis decidant rachibus," which seems to imply, that the small branches, on which the leaves are inserted, fall along with them as in pinnated leaves; or, in other words, are petioli communes.

In the next place, allowing the figure in this point to be erroneous, and that the insular, as well as the continental *sandal*, has simple opposite leaves, there is an essential difference in the structure of those of the two plants; those of the continental plant having no lateral ribs, while the figure of the insular *sandal* represents these organs distinctly; and Rumphius says (p. 43.), " folia multis parallelis venulis, uti in *Varinga*, ab utraque parte protuberantia."

Finally, the leaves of the insular plant are described as four inches long, and three broad, while it is a large leaf of the continental *sandal*, that measures two and a-half inches long, and one broad. These dimensions show also a great difference in form, which differs likewise in another respect, the leaves of the continental plant being generally obtuse, while all in the figure of Rumphius end in a very sharp point.

I am, therefore, not a little surprised, that Dr Roxburgh (Fl. Ind. 464. in the note), should say, " the leaves of our tree (continental *sandal*) agree particularly well with Rumphius's figure;" yet, in the text, he states, " I have reasons to think the tree which produces the *sandal-wood* of Malabar and Timor to be different." The sentence, indeed, in which this is contained, is obscure; but the above opinion, coinciding with mine, is abundantly clear. I shall have occasion farther to consider this subject, when I treat of the *Lignum papuanum* (p. 57).

Whether or not the *Santalum verum* of Breynius be the same with the plant of Rumphius, I cannot say; but both were quoted by Linnæus for his *Santalum album*, which he at first placed in the class *Octandria* (Burm. Fl. Ind.

87.), while the continental *sandal* has only four stamina. It was therefore certainly the insular *sandal* that Linnæus called *Santalum album,* although he seems afterwards (Juss. Gen. Plant. 356) to have drawn his generic character from the continental plant, thus confounding together the *Santalum album* with the *Sirium myrtifolium* of the Mantissa, which is no doubt the continental *sandal,* although Linnæus erroneously attributed to it a berry containing three cells, probably from his having found three seeds in the germen. The specimens in his herbarium decidedly prove, that his *Santalum album* did not belong to even the same natural order with the *Sirium,* or continental *sandal* (Brown, Prodr. Nov. Hol. i. 355).

Willdenow (Sp. Pl. i. 609), and M. Poiret (Enc. Meth. vi. 501), misled by the latter Linnæan generic character, confounded the two plants together; and, while they continued to quote Rumphius, and abandoned the name *Sirium,* they no doubt described the continental *sandal.* Even Mr Robert Brown, although aware that the *Santalum album* of Linnæus, or the insular *sandal,* was not even of the same order with the *Sirium myrtifolium,* gave the name *Santalum* not only to the latter plant, but to a whole order. The *sandal* of Timor, however, is equally entitled to the name, and its wood, I believe, is that most commonly so called, both in Europe and China. M. Lamarck, therefore, acted very properly in adopting the name *Sirium,* and in not quoting Rumphius (Ill. Gen. 304, No. 1537, t. 74). His *Sirium myrtifolium* is, however, probably that of Dr Roxburgh (Fl. Ind. i. 464), which the latter thinks different from that of Linnæus, the leaves of the latter being a good deal broader, and the glandular bodies between its stamina being undivided.

I have never seen the *Sirium,* or *Santalum myrtifolium* of Dr Roxburgh, but I have found that of Linnæus, or the *Santalum album* of Roxburgh, not only in Carnata, but in almost every part of Gangetic India above Mungher. In the latter country its wood is devoid of odour, and I believe it is exotic, being chiefly found about temples, and the tombs of Muhammedan saints, to which pilgrims very commonly bring curious plants. It is an error to call this *Malabar Sandal,* because it does not grow in that province, but on the mountains of Carnata, from whence it is sent to the coasts of Malabar and Coromandel (to use the European words) for exportation. Every where in the south of India, it is called *Sri Gunda,* or rather *Gundha,* the holy perfume; and this name has been corrupted by European botanists into *Sarcanda.* Concerning the name *Sambarana,* which Rumphius says is the proper appellation of the continental *sandal,* I know nothing. In the Hindwi dialect it is called *Sandal,* but in the Bengalese, as well as in Sanscrita, it is most commonly called *Chandana,* from which *Sandal* is no doubt a corruption. In the latter language it is also called *Malayasa,* or the produce of mountains. For an account of the management of the tree in its native country, I may refer to my Journey to Mysore (i. 186, 202; ii. 117, 132, 536; iii. 192).

SANDALUM RADICIS, p. 46.

Whether or not this is a distinct plant from the *sandal* of Timor, it is impossible from the account of Rumphius to say. The *sandal* of Keyely, mentioned lower down in the page, is probably the same with the tree producing the *Sandalum radicis ;* at least both grow in Celebes.

Whether or not the *sandal* of the Feejee and Sandwich Islands belong to the Timor species, or *Santalum album* of Linnæus, I know not; for Rumphius (p. 46.) properly admonishes us, " notandumque et attendum, plurima odorata ligna a scriptoribus denotari *Sandali* denominatione, uti inter alios O. Daperus in Africæ descriptione dicit, in regno Ansiko, quæ media est Africæ regio, binas invenire magna copia *Sandali* species,

> RUBRUM nempe, ibi TAWILE, et
> ALBUM ZIKONGO vocatum ;"

but there is not the smallest reason to suppose, that either of these is the same with the *Santalum rubrum*, or *S. album* of Asia.

CAP. XVII.

SANDALUM RUBRUM, p. 47.

Rumphius commences this chapter by exposing the error of those, who imagined the trees producing *red sandal* to be similar to those which produced the *white* or *yellow*. He then mentions, that so many different woods were brought to him as *red sandal*, and these accompanied by accounts so contradictory, that, having never been near the places where they grow, he could come to no certain conclusions ; only he warns us to reject the opinion, that all such red woods as are produced in India, are of one kind. After rejecting the *Lingoo* (*Pterocarpus Indicus*), and the *Sapan* (*Cæsalpinia sapan*), he mentions three kinds.

SANDALUM RUBRUM USUALE, p. 48.

There can be little doubt, from circumstances here mentioned, as well as from the native names procured by Dr Roxburgh, that the *Lignum Caliatourense*, or *Rakta Tsjandana* (red sandal) of the Sanscrita language, which Herbertus de Jager transmitted to Rumphius as the *Santalum rubrum usuale*, is the *Pterocarpus Santalinus* (Willd. Sp. Pl. iii. 906 ; Hort. Kew. iv. 249 ; Hort. Beng. 52) ; and I suspect the *Pterocarpus Draco α*, which M.

Poiret (Enc. Meth. v. 726) saw in M. Lamarck's collection; for this is an Indian and not an American plant, as the *P. Draco* of Willdenow is; and the figure which M. Lamarck gives of the fruit (Ill. Gen. t. 602, f. 2), is exactly alike. It is true, that M. Poiret describes also a *P. santolina* (Enc. Meth. v. 727); but he had seen no specimen, and I suspect that he has described the same plant under two names. The specific character (foliis ternatis) given to the *P. santolina,* probably deterred him from admitting them to be the same. This tree is common on all the mountains of India south from the Ganges. In the woods of Gangetic India, where I found it, the name used was *Pasar,* but to Dr Roxburgh it was called *Rucla Chandana,* in both the Hindwi and Bengalese dialects, and in the Sanscrita *Koo Chandana,* evidently the same with the Koe Tsjandanam, given by Rumphius as a name used by the Brahmins of Caliatour (Krishna patana). In Carnata it was called to me *Whonay* (Buchanan's Mysore, i. 184), on which account the specimens sent from thence to Sir J. E. Smith were called *Pterocarpus Honna.* This I shall here describe, leaving it to others to determine the difficulties that have arisen from confounding an American and Indian *P. Draco.*

Arbor excelsa materie optima, succo corticis sanguineo. Rami teretes, ad petiolos nodosi. Folia alterna, cum impari pinnata; foliola 3–6 per paria approximata, pedicellata, ovalia vel oblongo-ovata, basi obtusa, integerrima, emarginata, supra nitida, subtus glabra, in planta siccata præsertim nervis utrinque prominulis reticulata, subcostata, plana, firma. Petiolus communis basi incrassato teres, glaber, foliolis brevior, non stipulaceus.

Racemi terminales, paniculati, laxi, foliis breviores. Flores sparsi, pedicellis longiores, flavi, immaculati, odoratissimi. Bracteæ parvæ, squamæformes, caducæ, concavæ, ad calycis basin geminæ, ad pedicelli basin solitariæ. Tomento nigro teguntur calyces, bracteæ, et pedunculi.

Calyx turbinatus, denticulis quinque obtusis, quorum duo superiores paulo longiores, subæqualis. Corolla unguibus longitudine calycis plicata. Vexillum subrotundum. Alæ vexillo breviores, subrotundæ. Carina alis brevior. Filamentum unicum, supra dehiscens, laciniis alternis brevissimis decemfidum. Antheræ subrotundæ. Germen oblongum, pilosum. Stylus rectus, subulatus. Stigma simplex.

Legumen falcato-subrotundum, foliaceum, pedicellatum, nervosum, seminibus transversis subdispermum.

From the lower mountains of Nepal, adjacent to Cosala, I received branches of a tree, without flower or fruit, very little different, however, from the preceding, but called *Bijaya Sala*, on which account the specimens sent to the India House have been called *Pterocarpus Vijaya.* I shall here describe it, leaving it to others to determine whether it be truly different.

Cortex succo sanguineo scatens. Ramuli teretes, ad folia nodosi. Folia alterna, cum impari pinnata. Foliola 5–9 per paria approximata, pedicellata, integerrima, emarginata, supra nitida, subtus nuda, equilateralia, costis parallelis striata, nervis utrinque prominulis reticulatissima, firma, undulata, inferiora basi obtuso-ovata, superiora basi acutiusculo ovato-oblonga. Petiolus communis basi incrassato, teres, glaber, foliolo brevior, non stipulaceus.

In the western parts of Gangetic India I found a tree very nearly allied to the *Pterocarpus Santolinus*, having a fruit exactly similar. This I take to be the *Pterocarpus Marsupium* (Hort. Beng. 53; Willd. Sp. Pl. iii. 905; Enc. Meth. v. 730), and it is chiefly distinguished by having its leaflets larger and blunter, being often retuse rather than emarginated. I have not seen the flower; but I consider it as scarcely at all different from a tree that I found in the south of India, and gave specimens to Sir J. E. Smith, under the name of *Pterocarpus Vaynga.* These specimens I compared with those of the *Pterocarpus bilobus* in the collection of Sir J. Banks, and I have no doubt of their being the same. The foliola of this plant from the south of India are much contracted in breadth towards the base, and are, in general, more deeply retuse than those of what I have called the *Pterocarpus Marsupium;* but I see no other difference. In Carnata it is called *Yegu* (Buchanan's Mysore, i. 26.), in Chæra it is called *Vaynga* (Ibid. ii. 246), which I adopted as a specific name; but if it be different from the *Marsupium*, the name *bilobus* is certainly preferable.

Although Rumphius agrees so far with Jager, as to consider the *Lignum Caliatourense* as the *Sandalum rubrum* most commonly sent to Europe; yet he thinks that the kind used in Arabia and the East is the produce of Africa (p. 49.), and likely therefore of a different tree, probably the *Tawille* mentioned in page 46, and also in page 53.

SANDALUM RUBRUM MALAICENSE, p. 50.

This tree seems to grow in the southern provinces of Siam, but the notices respecting it are so obscure, that I can form no conjecture about its affinities. Were it not that Rumphius perfectly knew the *Sappan*, I should have supposed it to be the same.

LIGNUM TSJIDII SINENSIUM, p. 50.

Nothing is said concerning this tree, but that it grows in the province of Quantunga (Canton), and reaches only to a small size, being crooked so as only to be fit for making the small cups and sticks used by the Chinese, in drinking and eating, in place of wine-glasses and forks. For these purposes it is chosen, on account of its being supposed an antidote against poison. A small crooked tree of this description is very common in the south of India, and is called there *Devadaar*, and *Black Sandal*, and may be the same. By Plukenet it has been twice mentioned. First he called it *Arbor Indica pruni sylvestris folio, corni maris fructu longiore cujus lignum Santalum nigrum ab indiginis habetur.* (Mant. 26;

Amalth. 21, t. 442, f. 3). Secondly, he called it *Santalum nigrum Devadarre Malabarorum* (Mant. 167; Amalth. 187, sed non t. 442, f. 1 et 2, quarum prior calycem habet superum, posterior corollam monopetalam bilabiatam). Dr Roxburgh called this plant *Erythroxylum monogynum*, a name adopted by M. Poiret (Enc. Meth. Sup. ii. 587); but Decandolle (Prodi. i. 573) properly considers it as belonging to a different genus, and calls it *Sethia Indica*. If a trifling natural order, such as the *Erythroxyleæ* of Kunth, is to be established for twenty-six species, divided into two genera, the characters, by which the order is to be distinguished, must be either altered, or the genus *Sethia* must be removed, thus leaving one small genus to compose what, in the new-fangled system, is called a Natural Order. On this account, I shall here give a description of the *Sethia* taken in Mysore (1800), specimens from whence were given to Sir J. E. Smith by the name of *Erythroxylum Sideroxylloides*, for which I then mistook it. Specimens have also been sent to the India-House under the name given by Dr Roxburgh.

Arbuscula tortuosa. Rami diffusi, teretes, glabri, alterni. Folia alterna, cuniata s. obovata, integerrima, emarginata, glabra, enervia, venosissima, plana. Petiolus compressus, canaliculatus, brevissimus, glaber, stipulæ geminæ, laterales, marcescentes, sessiles, semiovatæ, erectæ, integerrimæ, brevissimæ.

Pedunculus axillaris, uno vel altero sæpe deficiente, ternus, erectus, folio multo brevior, uniflorus, incrassatus, non bracteatus. Flores erecti, folio multo minores, herbacei.

Calyx quinque dentatus, erectus, persistens, petalis multo brevior. Petala quinque calycis incisuris inserta, ungui concavo mellifero, limbo duplicato, quorum exterior patens, oblongus concavus; interior erectus, brevis, coloratus, bifidus. Filamenta decem urceolo hypogyno, cylindrico, integerrimo ad marginem inserta. Antheræ parvæ. Germen superum, subtrigonum, urceolo paulo longius, stylus unicus, teres, indivisus. Stigmata tria clavata.

Drupa oblonga, obsolete trigona, pulposa. Nux oblonga, trilocularis, trisperma.

SANDALUM RUBRUM E TSJAMPA ET CAMBODIA, p. 50.
SANDALUM RUBRUM TIMORENSE, p. 51.

These seem different species, not only from all those above mentioned, but from each other. Nothing, however, is known of the trees that produce them.

While such a number of plants have been called *Sandalum rubrum*, and so little is known of the greater part, it would be impossible to refer the synonyma given by Burman, in his observation, with any accuracy; and I must add to the difficulty by increasing the list of plants known by this name. In several places of Gangetic India, the *Adenanthera pavonina* has been shown to me as the *Rakta Chandana*, or *Red Sandal*. In the alpine parts of Nepal, also, there is a tree called *Lal Chandan*, or *Red Sandal*, which is mentioned in my account of that country (p. 85). I saw neither flower nor fruit, but received specimens in leaf, which have been sent to the India-House. It has the habit of the *Laurinæ*.

Arbor ramulis glabris angulatis, ligno rubro inodoro. Folia alterna, oblonga, utrinque acuta, integerrima, glabra, costata. Petiolus brevissimus, non stipulaceus.

CAP. XVIII.

PSEUDO-SANTALUM AMBOINENSE, p. 54.

M. Lamarck called this *Aralia umbellifera* (Enc. Meth. i. 225); but he had not seen any specimen, nor is there any thing in either the figure or description of Rumphius to show that it really belongs to this genus, although it no doubt has the habit of the same natural order. The genus *Aralia*, indeed, as it stands in the last systematic writers, is quite unnatural. From some words in the description, we may perhaps infer that the *Pseudo-Sandalum* is diœcious, and that Rumphius had not seen the female: "Qui-nam subsequantur fructus, me latet, hæc enim capitula tarde sese aperiunt, nec in fructus excrescunt, sed frustra decidunt." In the figure, however, there is an appearance of each branch of the umbella being divided into three parts, each supporting one flower. The two lateral flowers in each division of the figure are represented unopened, while the central ones have the appearance of a corolla and calyx, each consisting of many divisions, as in the *Gastonia palmata* of Dr Roxburgh (Hort. Beng. 33), which, however, has more the habit of the *Aralia palmata* (Enc. Meth. i. 224), while the *Pseudo-Sandalum* has more the habit of the *A. cochleata* (*ibid.*)

Pseudo-Sandalum Bœrense, p. 55.

Although Rumphius saw neither flower nor fruit, we may judge, from what he says, that this belongs to the same natural order at least with the preceding; and, as its habit is similar, it may belong to the same genus.

CAP. XIX.

Lignum Papuanum, p. 57.

Among the natives of the great Indian Archipelago, a wood, strongly resembling *Sandal* (" duriores sunt *Sandalo citrino*—vero odor idem est"), is called *Rassamala*, and is of three kinds: first, the *Lignum Papuanum*, of a colour like honey, inclining to cineritious; second, a *white wood*, like ivory, from Tsjampa; and, third, a wood from Ceylon and Malabar, " odore penitus convenit cum *Caju* (Lignum) *Papua*, vel ejus odor jucundior quoddammodo est." This third kind, I have little doubt, is the *Sirium myrtifolium*, or *continental Sandal*; for Rumphius calls it *Sembrane*, while the name which he gives to the *Sirium* is *Sambarana*, evidently the same word. It must be this third kind, that

Burman in his observation confounded with the *Kækura ghaha* or *Vateria indica*, the smell of which has no more resemblance to that of *Sandal*, than its appearance has to the *Sirium*. We cannot, however, from thence conclude with Rumphius, that these three kinds of *Rasamala* are the same; and subsequent observations have pointed out (Enc. Meth. Sup. v. 545), that the *Lignum Papuanum*, meaning probably the first kind, belongs to the order of *Coniferæ*, and has been called *Altingia cærulea* by Persoon.

CAP. XX.

Caju (Lignum) Galedupa, p. 59, t. 13.

In treating of the *Pongam*, in a commentary on the Hortus Malabaricus (vi. 5), I have mentioned the errors that have arisen from M. Lamarck's having confounded that plant with the *Galedupa*, and thus having given rise to a genus *Galedupa*, in which this tree is not included. M. Lamarck, indeed, became sensible of this error, and therefore gave the name *Pungamia* to the new genus; but several botanists, willing enough to reject M. Lamarck's names, when right, continue the name *Galedupa*, which he acknowledges to be wrong.

On account of this tree having a resinous nature, scarcely known among the true *Leguminosæ*, and on account of the fleshy arillus embracing part of the seed (" fabæ—ad unam partem hilum gerunt carnosum et rugosum instar bursæ"), I suspect the *Galedupa* to be a *Copaifera*.

CAP. XXI.

Cortex oninius, p. 62.

Rumphius suspected an affinity between this and the *Cortex Winteranus* (*Drimis Winteri*, Decand. Prodr. i. 72);

but compares several of its parts with the *Lansium* (Jack. Lin. Trans. xiv, 115). If either of these conjectures were right, it should be one of the *Magnoliæ* by the first, or one of the *Meliæ* by the second, so that no reliance can be placed on either conjecture.

CAP. XXII.

CORTEX CARYOPHYLLOIDES, p. 65, t. 14,

In a commentary on the Hortus Malabaricus (Lin. Trans. xiii, 555), I have endeavoured to shew, that, although the *Cortex Caryophylloides* is the only authority for the *Laurus Culilaban* of Linnæus, it is not different from the *Carua.* Although, also, the *Culit Lawan* of Roxburgh in the Moluccas may be called *Poheree Lawun,* and although there is no appearance in the figure by Rumphius of the flowers growing by threes, as they do in Roxburgh's plant; yet, as Dr Roxburgh was very careful in synonyma, so far at least as could be judged from figures, his plant may very likely be that of Rumphius. The names *Tedjo* and *Eyck,* given to the *Cortex Caryophylloides* in some parts of Ceram, seem to be the same with *Tej* and *Twak,* given in Gangetic India to a very similar species.

CULIT LAWUN EX BATSJAM, } p. 68.
CULIT LAWUN EX JAVA,

The account of these is so short, that it is impossible to say whether they are different species, or mere varieties; but the sensible qualities seem a good deal different; and, without attention to these, there will be found a great difficulty in arranging plants so very similar as the different species of *Cinnamomum.*

CAP. XXIII.

SINDOC, p. 69.

In the commentary on the *Carua* (Lin. Trans. xiii. 553). I have noticed, that the younger Burman considered the *Sindoc* as the *Katou Karua* (Hort. Mal. v. t. 53), and have there stated all that I know of the subject.

CAP. XXIV.

LAURASTER AMBOINENSIS MAXIMA, } p. 70, t. 15.
…………… ……………… MINOR, }

It is impossible to say with certainty which of these plants the figure is intended to represent. It, no doubt, represents the flower, and Rumphius describes only the flower of the lesser kind; and it might be therefore supposed that the figure belongs to this; but then the size of the fruit suits the larger kind, and the flower is represented as divided into five, while, in the description of the flower of the smaller kind, it is said to be divided into two. If we could depend on these circumstances, the two plants should belong to different genera, and the figure should represent the largest kind, which may be of the same genus with the *Katou Karua* (Hort. Mal. v. t. 53), the flowers of which are divided into five.

CORTEX IGNEUS, p. 71.

Rumphius classes this with the two preceding plants, which are so ill defined, and he never saw any part but the bark. We know nothing whatever, therefore, of its botanical affinities.

CAP. XXV.

ARBOR ALBA MAJOR, p. 72, t. 16.
……… …… E JAVA, BORNEO, ET MALACCA, p. 74.

These seem to be two distinct species, as they grow naturally in very different situations, and possess different qualities; but, as usual, no notice is taken of this difference by Burman in his observation; and it has become the custom to consider this *Arbor alba major* as only of one kind, and as the only *Caju Puti.* This has occasioned numerous mistakes, as Rumphius has given figures of three kinds of *Caju Puti,* and this first kind, in all probability, includes two species. He considered them all as nearly allied to the genus *Myrtus,* although he confined the name *Myrtus Amboinensis* to his third kind.

Burman adopted the same idea, and the *Arbor alba major Amboinensis* he called *Myrto-Leucodendron foliis integris, lanceolato-inflexis, floribus staminosis, et fructibus urceolatis;* but he annexes a description by Garcin, which should have satisfied any one that it was no *Myrtus.*

Linnæus, however, in the first edition of the Species Plantarum, followed by the younger Burman (Fl. Ind. 116), called it *Myrtus Leucodendra;* but in this he included, without distinguishing them even as varieties, not only the *Arbor alba major Amboinensis* and *Javanica,* but also the plants represented in Plate 17, where two very distinct kinds are figured. There is, however, great reason from his Materia Medica to think, that by his *Myrtus Leucodendra* he meant the plant which produces the *Caju Puti* oil, and that therefore he ought not to have quoted the 16th plate; for Rumphius gives not the slightest reason to suppose that the tree which it represents gives any oil.

In the Mantissa, Linnæus found it necessary to separate the *Leucodendron* from the *Myrtus*, and founded a new genus, to which he gave the name *Melaleuca*, which means, whatever he intended, the *Black Populus alba.* In the Supplementum of the younger Linnæus, still another plant was added to the *Melaleuca Leucodendrum*, which in this state contained five species, one of which was indeed admitted to be a variety. This, however, was by Gærtner described as a new species, which he called *M. viridiflora* (De Sem. i. 173, t. 35), a name adopted by Sir J. E. Smith, when he pointed out its identity with the *M. Leucodendron* β of Linnæus (Linn. Trans. iii. 275). Notwithstanding, however, of his very uncommon accuracy and care, this distinguished botanist confounded the plant which gives the oil with the *Arbor alba* (H. A. ii. t. 16), the only real authority for his *Melaleuca Leucodendron* (Lin. Trans. ii. 274).

Willdenow (Sp. Pl. iii. 1428) adopts Sir J. E. Smith's specific character for his *M. Leucodendron*, and the idea of its being the plant which produces the cajeput oil; but, where he says " folia subavenia," he certainly had not before his eyes a specimen of either plant, and his expression was probably borrowed from Linnæus or Jussieu (Gen. Plant. 359); by the latter of whom even the habit of the plant is erroneously described; " folia subavenia; pedunculi breves, multiflori, ramulis insidentes infra folia." This is evidently taken from the figure, where the leaves are represented without nerves or veins; but in the description it is said, " folia per longitudinem nervos habentia novem decemve, quorum quatuor quinqueve (nervi veri) præ reliquis (venæ) eminent." In the figure, also, three of the parts bearing fructification are represented, as " spicæ multifloræ ramulis infra folia insidentes;" but the real inflorescence of this plant, as well as of several other allied species, is as follows: "Ramuli novi floribus sessilibus sparsis tecti, apice foliolis novellis comosi, post florescentiam in ramum foliosum basi fructiferum excrescentes," as may be seen in other three parts of the figure, even in Rumphius (t. 16). This structure did not escape Garcin, who in his last paragraph describes it excellently.

M. Desrousseaux (Enc. Meth. iv. 17) for his *Melaleuca Leucodendra* joins together the *Arbor alba* (H. A. ii. t. 16) *foliis multinerviis*, the *Cajuputi foliis trinerviis* (Ibid. t. 17, f. 1), and the specimens from Java, of which M. Lamarck has published an engraving (Ill. Gen. t. 641, f. 4), to which we shall again return. These are three distinct species; and he quotes the *M. viridiflora* of Gærtner with doubt.

Mr Robert Brown (Hort. Kew. iv. 410), although he quotes only the 16th plate, yet, in the specific character, he, in his *Melaleuca Leucodendron*, includes not only the kind with five large nerves, but also that with only three nerves in its leaves, which is that represented in Plate 17, fig. 1.

M. Lamarck, having procured from Sonnerat, a specimen of the *Arbor alba* from Java, published a figure of it for the *Melaleuca Leucodendra* (Ill. Gen. t. 641, f. 4). It differs from the plant of Sir J. E. Smith, in having its younger parts thickly covered with erect hairs. I found this plant in the botanical garden at Calcutta, to which it had been sent by Dr John Fleming, as the plant really producing the cajeput oil; and such may be the case, although, according to Rumphius, an oil is produced by the species with three nerves; while this has five principal nerves, besides several veins disposed longitudinally between them. These veins, indeed, are not continued the whole length of the leaf, but form occasional anastomoses. Still, however, they give the leaf the appearance of having nine or ten longitudinal nerves, as represented by M. Lamarck, although his figure makes the nerves appear stronger than they do in Dr Fleming's plant.

The *Arbor alba major Javanica*, from its growing erect like a Spruce Fir (*Picea*), from its delighting in plains near the banks of rivers, and from the superiority of its timber and odour, surely ought to be considered as a distinct species, as Dr Roxburgh has done, calling it *Melaleuca Cajuputi.* Whether or not Dr Fleming had sufficient reason for concluding that the cajeput oil is procured from this tree, I cannot say; but I place great confidence in his accuracy. Further, M. Desrousseaux had received information that the cajeput oil is the produce of a broad-leaved *Melaleuca*, which confirms the opinion of Dr Fleming; for this must be the plant, the *Arbor alba major Amboinensis* producing no such oil. It is besides to be remarked, that Rumphius attributes to the *Arbor alba* of *Java* a greater degree of aromatic quality than to the *Arbor alba major* of *Amboina*,—on which account, indeed, he is disposed to consider it as more nearly allied to the *Arbor alba minor;* but this, although it yields an oil ("tenue pellucidum ac subtile") is certainly a distinct species; for it has three nerves in its leaf, and is only a large bush,—while the plant of Java is a tree with five strong nerves in its leaf; besides, the oil of the Amboina plant, being pellucid, is probably different from the Cajeput, which is green,—a circumstance that Rumphius would not have failed to notice. I have sent to the India House specimens of Dr Fleming's plant, from whence the European botanist may readily judge whether or not it is in fact a distinct species.

Arbor Koring, p. 74.

This tree, by an operation exactly similar to that used for the same purpose with *Dipterocarpus*, yields an oil used for burning, and is therefore probably of the same genus. In Chatigang there are two species of *Dipterocarpus* which produce oil; one of which has leaves, except in size, not very unlike those of the *Mangium album*, with which Rumphius compares those of the *Koring*, and it may therefore be the same. In 1798, I sent to Sir Joseph Banks four species of this genus, which I then called *Hopea;* and it was from two of these, probably, that Gærtner took his figures and descriptions of the *Dipterocarpus costatus* and *D. turbinatus* (De Sem. iii. 50, 51, t. 187, 188, f. 1). It must be remarked, that the generic name of these plants among the Bengalese is *Garjan*, and they divide this into two species, *Telia* and *Dulia*, from the uses to which they are applied; for two of them give oil (*tel*), and two are used for constructing litters (*duli*). It is remarkable, that of each kind there is one with a fruit like the *D. costatus*, while the fruit of the other resembles that of the *D. turbinatus;* also, that, of each kind, one grows near the sea, and the other on the mountains. Further, Dr Roxburgh mentions four species (Hort. Beng. 42), probably the same with those which I found in Chatigang, although one of them came from Pegu, where, as well as in the Andaman Islands, I have seen an oil-bearing kind, although I had not there an opportunity of examining the fructification. I shall here describe the kinds, of which I sent specimens to Sir Joseph Banks, quoting the catalogue sent along with them as Buchanan MSS.; for I must now, in compliance with custom, adopt the barbarous generic name given by Gærtner; nor are his specific names good, two plants being equally entitled to the appellations *costa-*

tus and *turbinatus.* All the species are very lofty large trees, with straight stems.

I. Dipterocarpus læвis.

Hopea lævis, Buchan. MSS.
Arbor Koring, Herb. Amb. ii. 74. ?
Telia Garjan Bengalensium.
Habitat in Tripuræ australis montibus.

Ramuli subancipites, striati, stipulorum cicatribus annulati, læves. Folia alterna, ovata vel oblongo-ovata, basi emarginata, integerrima, acuta, utrinque nitida, costata, venosa, uncias novem longa, quatuor lata. Petiolus brevissimus, depressiusculus, ad apicem incrassatus, glaber. Stipulæ gemmaceæ, geminæ, oppositifoliæ, lineares, obtusæ, caducæ.

Spica supra axillaris, solitaria, nutans, flexuosa, folio brevior, simplicissima, 4–9 flora. Pedunculus teres, glaber, ad flores incrassatus. Flores magni, odorati, petalis medio rubicundis albi, alterni.

Calyx cylindricus, lævis, quinquefidus laciniis tribus minimis obtusis, duabus foliaceis linearibus petalorum longitudinem fere æquantibus. Petala quinque linearia, patentia, concava, obtusa, obliqua, ad basin subunita. Filamenta plura, brevissima, receptaculo inserto, squamis plurimis minutis erectis extra cincta. Antheræ erectæ, hastatæ, ad apicem cristatæ. Germen subrotundum, superum. Stylus longitudine calycis clavatus. Stigma simplex, concavum.

Nux calyce acuto circinato, cujus laciniæ duæ alares maximæ, tecta, monosperma, coriacea. Perispermum nullum. Embryon albidum, plicatum, integumenti rugis ferrugineis ruminatum.

II. Dipterocarpus costatus, Gært. de Sem. iii. 50, t. 187.

Hopea conduplicata, Buchan. MSS.
Telia Garjan Bengalensium.
Habitat in Tripuræ australis maritimis.

Ramuli teretes, pubescentes, cicatricibus stipularum annulati. Folia alterna, ovata, repanda, acutiuscula, supra nuda, subtus pubescentia, costata, venosissima, in adulta arbore sex uncias longa, quatuor lata; in juniore arbore duplo fere majora. Petiolus subdepressus, ad apicem incrassatus, brevis, pubescens. Stipulæ gemmaceæ geminæ, oppositifoliæ, caducæ, sublineares, pubescentes.

Racemi axillares, 3–4-flori. Flores non vidi.

Fructus a Gærtnero curate descriptus.

III. DIPTEROCARPUS SCABER.

Hopea scabra, Buchan. MSS.
Dulia Garjan Bengalensium.
Habitat in Tripuræ australis montibus.

Rami subancipites, striati, pilis fuscis barbati, cicatricibus stipularum annulati. Folia alterna, oblongo-ovata; basi emarginata, repanda, acuta, pilis fasciculatis utrinque scabra, costata, venosa, quatuor cum dimidio uncias longa, duas cum dimidio lata. Petiolus apicem versus incrassatus, supra planiusculus, brevissimus, barbatus. Stipulæ gemmaceæ, oppositifoliæ, geminæ, caducæ, barbatæ.

Spica supra axillaris, simplicissima, 4–9-flora pedunculo barbato. Flores non vidi.

Calyx fructiferus costis membranaceis quinque longitudinalibus carinatus, scaber, pilosus, subglobosus, desinens in alas quinque obtusas, quarum tres breves, erectæ, conduplicatæ, duæ longissimæ, oblongæ. Nux cotyledonibus ut in cæteris speciebus plicatis.

IV. DIPTEROCARPUS TURBINATUS, Gærtn. de Sem. iii. 51, t. 188, f. 1.

Hopea trinervis, Buchan. MSS.
Dulia Garjan Bengalensium.
Habitat in Tripuræ australis maritimis.

Ramuli pilorum nudi, teretes, cicatricibus stipularum annulati. Folia alterna, ovata, integerrima, acuta, utrinque præsertim ad margines pubescentia, costata venosa, minora quam in *D. carinato.* Petiolus teretiusculus, ad apicem incrassatus brevis pubescens. Stipulæ geminæ suboppositifoliæ, caducæ, gemmaceæ, sublineares, pubescentes.

Racemus axillaris, 3–5-florus. Flores non vidi.

Fructum optime descripsit Gærtnerus.

In treating of the *Paenoe* (Hort. Mal. iv. 33), I have noticed the natural affinities of this genus, and I therefore think, that M. Decandolle should have placed it, and the plants resembling it, immediately before the *Guttiferæ.*

CAP. XXVI.

Arbor alba minor, p. 75. t. 17. f. 1.

A difficulty here occurs. In this chapter Rumphius describes only one plant, the *Caju Kilan*, or *Daun Kitsjil* of the Malays, with three nerves in its leaves; but in this plate there are represented two very distinct species, neither of which has any nerves. Although this is, no doubt, owing to the want of care in the draughtsman, yet it leaves us in the dark concerning the figure, which belongs to the description; and about this botanists seems to differ. In the explanation of the plate, annexed by the editor Burman to this chapter, he considers the first figure as belonging to the *Caju Kilan*, or *Daun Kitsjil*, here described; and calls it *Myrto-Leucodendron foliis lanceolatis, incurvis; fructus in inferiore ramorum parte gerens;* while Fig. 2, he says, is the *Daun Poeti Kitsjil* of the Malays, which he calls *Myrto-leucodendron foliis lanceolatis acutis, floribus et fructibus spicatis.* No such plant, however, so far as I can find, is described by Rumphius, having been probably left out by the editor from the same want of care that is conspicuous in his specific character, in which he has totally mistaken the figures, as supposing the inflorescence different in the two plants.

M. Desrousseaux (Enc. Meth. iv. 17.), respecting Fig. 1, follows the opinion of Burman, and considers it to represent the three-nerved plant described by Rumphius, which he calls a mere variety of the *Arbor alba major;* but in this I think he is clearly mistaken, the difference of size, place of growth, and qualities, as well as the number of nerves, evidently marking them as two species.

Sir James E. Smith, on the contrary, thought Fig. 2. to be the plant described, for, in treating of the *Metrosi-*

deros saligna (Lin. Trans. iii. 273.), he mentions as follows: " Rumphius, tab. 17. f. 2. vol. ii. has some resemblance to this plant, but he describes his as very aromatic, which ours is not at all." But the aromatic plant described by Rumphius is that which Burman and Desrousseaux consider as represented in Fig. 1. While I am fully sensible of the great general accuracy of my friend Sir James, I must acknowledge that in this point he seems to be wrong; for the account of the leaves of the *Arbor alba minor* by Rumphius (" folia prioris," *Arboris albæ nempe majoris*, " sunt similia, sed dimidio minora, tres quatuorve pollices longa, vix minorem digitum lata,") is more applicable to Fig. 1. than to Fig. 2. On these grounds we may perhaps be allowed to conclude, that the *Daun Katsjil* (t. 17. f. 1.) described by Rumphius, is a species of *Melaleuca* not yet introduced into the system, but which may be called *M. trinervis;* while the *Daun Poeti Kitsjil* (t. 17. f. 2.) is the *Metrosideros saligna*, not described in *Herbarium Amboinense.*

CAP. XXVII.

Myrtus Amboinensis, p. 77. t. 18.

Burman, in the explanation of the plate, calls this *Myrtus Amboinensis montana*, for which latter phrase I see no authority in the text. M. Lamarck (Enc. Meth. iii. 467.) states, that this is certainly a species of *Leptospermum*, very nearly allied to his *L. salicifolium;* but mentions, as a distinguishing mark, the difference in the inflorescence, which in my opinion is quite sufficient. He also pointed out the affinity of his *L. salicifolium* to the *Melaleuca virgata* of the younger Linnæus; but observed that the one had terminal, and the other axillary umbels.

M. Desrousseaux (Enc. Meth. iv. 18.) considered the *Myrtus Amboinensis* as the *Melaleuca virgata*, which has terminal umbels, while the flowers of the *M. Amboinensis* are solitary. Besides, there are only ten stamina in the *M. virgata* (Smith, Lin. Trans. iii. 264), while there are from twenty to twenty-five in the *M. amboinensis*. Willdenow, however, continued to quote the *M. Amboinensis* for the *Leptospermum virgatum* of Forster, which is the same with the *Melaleuca virgata* of Linnæus.

Sir J. E. Smith (Lin. Trans. iii. 263.) rejected this supposition, and proposed, with doubt, the *Myrtus Amboinensis montana* for his *Leptospermum lanigerum*. I see no reason for this supposition, as the leaves in the figure are by no means obovato-lanceolata, nor are the divisions of the calyx persistent, as my worthy friend mentions in his specific character of the *L. lanigerum ;* besides, he seems to have overlooked a circumstance, which appears to me to mark the *Myrtus Amboinensis* as not belonging to the genus *Leptospermum*, as Sir J. E. Smith defines it, relying chiefly on the form of the stigma capitatum; but Rumphius says, " in staminum centro erigitur pistillum erectum acuminatum." But, farther, its seeds are not angular, as in the genus *Leptospermum ;* for Rumphius says, " semen-paleaceum instar fili dissecti." On the whole, I am inclined to think that this plant has not been seen by recent botanists, and that it cannot be reduced to any of the genera of the order of *Myrti* described by Sir J. E. Smith; but belongs to a genus which may be defined :—Calyx quinquefidus laciniis deciduis; petala quinque staminibus 20–25 distinctis longiora; capsula supera, lateribus dehiscens, quinquelocularis; semina paleacea, filiformia.

CAP. XXVIII.

PIGMENTARIA, p. 79. t. 19.

This is, no doubt, the *Bixa Orellana* (Willd. Sp. Pl. ii. 1154.), a native of America, which has now spread all over the east.

CAP. XXIX.

ALLIARIA, p. 81. t. 20.

Under the name *Tamalassier*, M. Poiret (Enc. Meth. vii. 560) gives an account of this tree, taken from Rumphius, and without any conjecture concerning its affinities. I think that I have found the tree on the hills south from Goyalpara in Camrupa; and the specimens, which I have sent to the India House, I have called *Guarea Alliaria*, because the difference between the *Guarea* and *Trichilia*, by Willdenow and Jussieu, is made to consist chiefly in the former having eight, and the latter ten, stamina. M. Decandolle, however, places the difference chiefly in the *Trichilia* having three cells in the fruit, and the *Guarea* having four cells. According to him, therefore, the *Alliaria* should be a *Trichilia*, very nearly allied to the *T. alliacea* of Forster. These, however, are trifling and uncertain distinctions; nor does either M. Decandolle or Jussieu point out any thing in the habit, by which the two genera should be distinguished, and they should therefore be united.

I shall here describe, not only what I take to be the *Alliaria*, but several other trees, of which I have given specimens to the India House, and which cannot be separated from the *Trichiliеæ* of Decandolle, and this will serve to show, that in this natural assemblage of plants the position of the radicula is of no importance towards distinguishing the divisions of the same order, nor even probably of distinguishing divisions into natural genera. Whether more dependence can be placed on the number of parts, or in the presence or absence of an arillus, is not yet ascertained. Under these circumstances, as Decandolle includes only twenty-five species in the whole of this division, he probably would have acted more judiciously, in considering the whole as a genus, rather than as a natural order, excluding only the *Ekeberga*, which consists of one species, more nearly, perhaps, allied to the *Aurantiaceæ*, than to the *Meliaceæ*.

GUAREA ALLIARIA.

Alliaria, Herb. Amb. ii. 81. t. 20.
Rosuna Poma (Alliacea Cedrella) Bengalensium.
Habitat in summis Camrupæ orientalis montibus.

Arbor maxima. Ramuli crassi, cicatricibus magnis notati. Folia alterna abrupte pinnata. Pinnæ circiter decem parium suboppositæ, laterum posteriore abbreviato attenuato semiovatæ, integerrimæ, acuminatæ, glabræ, subcostatæ, venosæ, pedicellis brevibus insidentes, inferioribus brevioribus, latioribus. Petiolus basi incrassatus, teretiusculus, glaber, pinnis longior. Rachis glaber, apicem versus compressus, neque marginatus, neque canaliculatus, non stipulaceus.

Paniculæ axillares, folio breviores, racemis alternis brevibus patentibus compositæ, vel decompositæ. Pedicelli patentes, sparsi, sæpius uniflori, sed aliquando triflori. Pedunculus angulatus, vix pubescens. Bracteæ obsoletæ. Flores ex albido herbacei odore *Allii* gravissimo.

Calyx minimus, inferus, quadrilobus, obtusus. Petala quatuor acuta, linearea; basi erecta, cum se ipsis invicem et cum tubo stamenifero coalita; apice patentia. Filamenta coalita in tubum longitudine fere petalorum cylindricum ore truncato integerrimo. Antheræ octo parvæ, intra tubum sessiles. Germen superum, coronula cylindrica brevi cinctum. Stylus longitudine tubi teres. Stigma orbiculatum, planum.

Fructum non vidi: ex Rumphio capsula carnosa, trilocularis, trisperma loculorum uno vel altero sæpius deficiente obovata. Semina arillata. Integumentum lignosum, tenue, suturis 3–5 in segmentes totidem separabile.

Guarea paniculata, Roxb. Hort. Beng. 28 ?

Rosuna Poma Bengalensium.

Habitat cum præcedente.

Arbor præcedentis ejusdem nominis omnino similis, sed ramos, petiolos, folia, pedunculos habet pilis rectis subviscidis tectos. Pedunculus communis suprafoliaceus. Flores sæpius quinquefidi, minus fœtidi. Lignum rubrum.

Guarea Gobara.

Gobara phangyata (stercore conspurcata) Bengalensium.

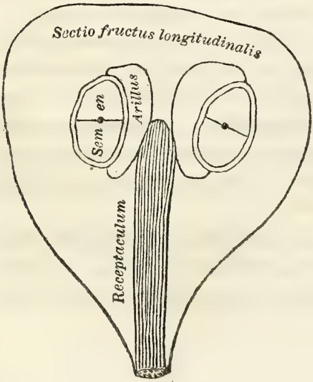
Habitat in Camrupæ orientalis montibus.

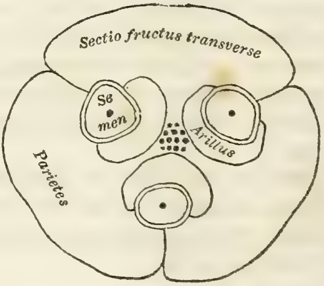
Arbor ligno albido. Ramuli rufo-tomentosi. Folia alterna, pinnata. Foliola utrinque 4–7 cum impari, basi inæquali retusa, apice nunc emarginata, tunc acuminata, glabra, costata, venosa, integerrima; inferiora breviora, subovata; alterna; superiora opposita, oblonga. Petiolus longitudine pinnæ compressus, basi incrassatus, supra planus, pubescens, non stipulaceus. Petioli partiales brevissimi, teretes. Rachis supra carinatus.

Paniculæ longitudine folii axillares, patentes, supra decompositæ ramis alternis, divaricatis, angulatis; ramulis brevibus, squamulosis. Flores odore stercoraceo albi.

Calyx concavus, minimus, denticulis 4 s. 5 incisus. Petala 4 s. 5 linearia, acuta, ungui lato abscendentia, apicem versus revoluta. Tubus antheriferus longitudine fere petalorum 4 s. 5-gonus, 8 s. 10 crenis incisus. Antheræ 8 s. 10 acutæ, intra tubi os sessiles. Germen superum, cinctum coronula cylindrica, stylo multo breviore, ad marginem filamentosa. Stylus teres. Stigma capitatum, truncatum.

Capsula carnosa, pyriformis absque calycis rudimento supera, pedi-





cellata, 3 s. 4 valvis, 3 s. 4 locularis, parietibus crassis, fungosis, intus membrana polita vestitis. Receptaculum centrale lignosum, ultra fructus medium pertingens. Semina solitaria arillo magno unilaterali cyathiformi carnoso lactescente semitecta, receptaculi ad apicem insidentia. Integumentum coriaceum, hylo lato deraso ad fundum arilli adnatum. Perispermum nullum. Cotyledones crassæ, carnosæ, hemisphæricæ, respectu fructus horizontales. Radicula in centro inter cotyledones.

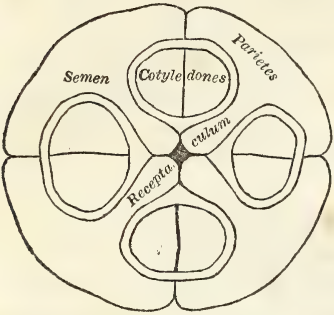
The *Arbor Nussalavica* (H. A. vii. 14.) seems to belong to the same genus; and, along with the preceding plants, I met with two other fine trees, which, although I did not see their flower, evidently belong to the same natural order; but they want the arillus. Whether or not such a circumstance should place them in a different genus, where the habit is so much alike, must be left to the discretion of those who compose systems: I shall not venture to separate them.

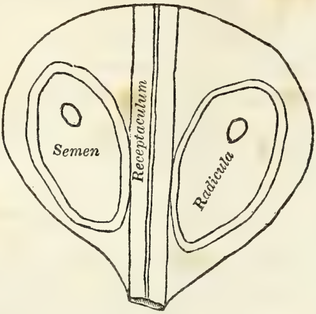
GUAREA GOTADHORA.
Bara Gotadhora Bengalensium.
Habitat in Camrupæ orientalis montibus.

Arbor magna ramulis nudis. Folia alterna, cum impari pinnata; foliola circiter 7 s. 9 alterna, petiolata, oblonga, basi obtusa, apice acuminata, integerrima, costata, venosa, glabra; inferiorum latera posteriora breviora, angustiora. Petiolus communis basi incrassato semiteres, nudus, foliolo brevior, non stipulaceus.

Pedunculus fructiferus axillaris, longitudine petioli lignosus. Fructus in eodem pedunculo duo vel tres.

Capsula nunc pyriformis, tunc orbiculata depressa, absque calycis rudimento supera, pedicellata, 3 vel sæpius 4-valvis, 3 s. 4-locularis, 3 s. 4-sulcus. Loculi membrana polita vestiti. Parietes crassæ, fungosæ, lactescentes. Receptaculum centrale 3 s. 4-alatum. Semina solitaria amygdalina. Integumentum crassum, coriaceum, lactescens. Albumen nullum. Cotyledones forma seminis crassissimæ, magnæ, extra virides, intra albæ, hinc convexæ, inde planæ, rectæ, respectu fructus verticales. Radicula in centro paulo supra medium cotyledonum posita.





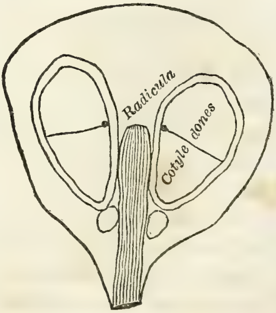
Guarea Amaris

Amari Bengalensium.
Habitat in Camrupæ orientalis montibus.

Arbor magna ramulis fusco tomentosis. Folia alterna cum impare pinnata. Foliola circiter octo parium opposita, oblongo, utrinque obtusa integerrima, glabra, costata, vix venosa. Petiolus non stipulaceus. Rachis compressus.

Paniculæ fructiferæ axillares et terminales.

Capsula pyriformis, carnosa, rubella, supera, absque calycis rudimento pedicellata, 3 s. 4-valvis, 3 s. 4-locularis, loculis membrana polita vestitis. Receptaculum centrale, lignosum, ad medium fructus e basi pertingens. Semina nonnullis sæpius abortivis solitaria, oblonga, non arillata, apici receptaculi per medium inserta. Integumentum coriaceum, crassum. Albumen nullum. Cotyledones crassæ forma seminis, carnosæ, hemisphæricæ, respectu fructus horizontales. Radicula ad unum latus, receptaculum versus, inter cotyledones nidulans.



CAP. XXX.

CASSIA FISTULA, p. 83. t. 21.

In a Commentary on the Hortus Malabaricus (Lin. Trans. xiii. 484.), I have mentioned several circumstances relative to this plant, which, notwithstanding some differences in the figures, I have no doubt is the *Conna* of Rheede; nor will it be necessary to enter into any detail concerning the synonyma of a tree so long known, and so widely spread. The remark, however, of Burman, after enumerating the synonyma, requires the full consideration of those who wish to give the synonyma with accuracy; for he alleges, that most preceding authors who had figured the *Cassia Fistula*, had taken their drawings from different species.

Rumphius considers his *Cassia Fistula* as originally a native of Africa; but this seems doubtful, for I have found it common in the woods, even of the most remote parts of India, where it grows to a large size, produces a valuable timber, and has an appropriate name in every dialect. An observation of this excellent author deserves more attention: "*Cassiæ Fistulæ* in Oriente multæ inveniuntur species ac varietates; una nempe parvis angustisque foliis, altera majoribus." The latter, which he first described, is the *Conna* of Rheede, and the *Cassia Fistula* of Linnæus. I shall now proceed to consider those with smaller leaves.

CASSIA FISTULA JAVANICA FLORE RUBRO, p. 86.

Commeline, in the Hortus Amstelodamensis, figured a plant, that he called *Cassia Fistula Javanica flore carneo.* This is the *Cassia Javanica* of Linnæus (Willd. Sp. Pl. ii. 527.), which I should have presumed (for I have not his work) to be that now under consideration, had not M. Lamarck (Enc. Meth. i. 649.) quoted for the Linnæan plant the *Cassia fistula silvestris* of Rumphius, described in the next chapter. M. Lamarck's accuracy induces me to suppose him right; although, when in Ava, I found a beautiful tree called *Priban-gno gri* by the natives, which I think is probably the *Cassia Fistula Javanica flore carneo*, although, when I sent specimens to Sir Joseph Banks, I called it *Cassia Javanica.* I shall here describe it.

Arbor mediocris. Ramuli subangulati, pubescentes. Folia alterna, non glandulosa, abrupte pinnata. Pinnæ 9–15 parium pedicellatæ, oblongæ, obtusæ, utrinque emarginatæ, integerrimæ, venis reticulatæ, utrinque pilosæ, subtus pallidæ, laterum posteriore longiore; anteriore latiore; intermediis longioribus. Petiolus teres, brevis, pubescens. Rachis angulo superiore carinato subtetragonus, ad apicem mucronatus. Pedicelli breves, pubescentes. Stipulæ binæ, magnæ, reniformes, per sinum adnatæ, integerrimæ, venosæ, glabræ.

Racemi axillares, folio breviores, indivisi, stricti, multiflori. Pedunculus teres, pubescens. Flores sparsi, solitarii, pedicellati, magni, sed flore *C. Fistulæ* minores, rubescentes. Bracteæ ad singulorum pedicellorum basin triphyllæ, foliolis ovatis, acuminatis, pubescentibus, pedicello brevioribus; intermedia duplo majore: infra flores ad pedunculi communis apicem nonnullæ, monophyllæ, sagittatæ.

Calyx coloratus. Petala lanceolata, venosa. Stamina decem, inæqualia ut in genere.

Legumen non vidi, sed secundum Rumphium " siliqua est ut in *Cassia Fistula.*"

CASSIA JAVANICA FLORE ALBO, } p. 87.
CASSIA JAVANICA FLORE PURPUREO, }

Rumphius says, " Utræque hæ forte conveniunt cum subsequente *silvestri Cassia Fistula*," probably meaning, that their seeds are not surrounded by pulp, which is the only distinguishing circumstance mentioned by him, the colour of the flower excepted, and in this these two plants differ from the *C. F. silvestris.*

CASSIA JAVANICA FLORE LUTEO, p. 87.

Concerning this Rumphius says, "Siliqua medicata—cum fistularum pulpa opium adulteratur." It thus differs from all the others in the following particulars: from the *Cassia Fistula,* in having small leaves; from the *Cassia Fistula Javanica,* and the two other *Cassiæ Javanicæ,* in the colour of the flower; and from the *Cassia Fistula silvestris,* in having its seeds surrounded by pulp.

CAP. XXXI.

CASSIA FISTULA SILVESTRIS ALBA S. FLAVESCENS, } p. 88.
CASSIA FISTULA SILVESTRIS RUBRA, } t. 23.

There is nothing to indicate to which of the above plants the figure belongs, although it is not probable that they are of the same species; for uncultivated plants seldom vary in the colour of the flower; and even in those which are much cultivated, and produce a variety of colours in their flowers, it is seldom that they vary from red to yellow. M. Lamarck, therefore, who has quoted the *Cassia Fistula silvestris* (Enc. Meth. i. 629.), in joining it with the *Cassia Fistula Javanica flore carneo* of Commeline, to form the *Cassia Javanica,* should have had the red kind alone in view. If this quotation is correct, the red kind should be the *Cassia Javanica,* provided Linnæus, under this name, really described an Asiatic plant; but this is doubtful, as besides Commeline's plants from Java, he includes one from Brazil, now called *Cassia mollis;* nor can I ascertain which he really meant. M. Lamarck, even although he rejects this plant of Brazil, introduces into the same species with the *Cassia Fistula silvestris* a plant of Peru, with a gland between the lower leaves, and he seems to consider the variation of red and yellow flowers a mere accidental circumstance, not even constituting what botanists call a variety. His quotation is also rendered doubtful by Burman, who, in his observation, quotes as synonymous the *Cassia Fistula Indica flore carneo Cl. Jageri* of Breynius, which is not the *Cassia Javanica* of Linnæus, but the *Cassia bacillus* of Gærtner (de Sem. ii. 313.) and Roxburgh (Hort. Beng. 31.)

I am inclined to think, that I met with the red-flowered kind in the district of Chatigang, where it is called *Bandur lati* (Simiæ bacillum), and from thence sent it to Dr Roxburgh, who called it *Cassia nodosa*, on account of the knots on three of the filaments, of which the round bodies in the centre of the flowers, in the figure of Rumphius, may be intended for a representation. If I am right in my conjecture, and if this be the *Cassia Fistula Javanica flore carneo* of Commeline, the name *nodosa*, however applicable, must be abandoned; but my plant may be the *C. F. silvestris flore rubro*, without being either *Cassia Javanica* of Linnæus, or the *C. bacillus* of Gærtner, neither of whom quoted Rumphius; and in this case the name *nodosa* should be retained, provided the round bodies in the figure of Rumphius are meant to represent the knots on the filaments. In 1798, I sent to Sir J. Banks specimens of this tree, which differs from that figured by Rumphius, chiefly in having more pointed and larger leaflets.

Arbor mediocris. Ramuli subangulati, alterni, bifarii, pubescentes, virides. Folia bifaria, alterna, abrupte pinnata, non glandulosa. Foliola 8–10-juga, petiolata, ovato-oblonga, integerrima, acuta, mucronata, supra nitidi, subtus nuda, venosa, plana, superioribus sensim longioribus uncias 3½ longis, 1½ latis. Petiolus communis basi incrassato subangulatus, brevissimus, pubescens. Rachis supra subcarinatus, sulcatus, pubescens, mucrone subulato terminatus. Petioli partiales suboppositi, teretes, pubescentes, brevissimi. Stipulæ laterales geminæ, deciduæ, lunatæ, adnatæ, erectæ, integerrimæ, utrinque acutæ, parvæ.

Racemi axillares, solitarii, patentes, folio dimidio breviores, simplices, multiflori. Pedunculus teres, pubescens. Flores subterni, cernui, magni, rubicundi, pedicellati. Pedicelli flore longiores, colorati. Bracteæ ad pedicellorum singulorum basin tres, lanceolatæ, acutæ, incurvæ; integerrimæ, coloratæ, intermedia multo longiore, denticulo utrinque notatæ.

Calyx coloratus, quinque partitus laciniis oblongis, obtusis, reclinatis, corolla multo brevioribus. Petala quinque lanceolata, acuta patentia, subsessilia venosa, æqualia. Filamenta decem; quorum tria inferiora longiora, declinata, ad basin erecta, dein reclinata, subulata, sed infra apicem nodo magno ovato aucta; quatuor intermedia utrinque attenuata, erectiuscula, apicem versus ad angulum acutum deflexa; duo proxima ad basin crassa erecta, ad apicem filiformia, spiraliter convoluta; summum brevissimum, utrinque attenuatum, erectum. Antheræ in filamentis tribus inferioribus oblongæ, basi emarginatæ, supra planæ extra convexæ, effœtæ; quatuor intermediæ clavatæ, incumbentes, ad basin poris duobus dehiscentes; duæ proximæ oblongæ, quadrisulcæ, effœtæ; summa oblonga, quadrisulca, ad apicem poris duobus dehiscens. Germen longitudine staminum longiorum pedicellatum, lineare, incurvum, declinatum. Stigma simplex.

Legumen lignosum, teres, pedem unum vel alterum longum, septis transversis multiloculare, vix dehiscens. Semina parva, ovata, emarginata, arillo suberose orbiculato plano tecta.

Besides the *C. Fistula* and *C. nodosa*, Dr Roxburgh has described three other species with a similar fruit, one or other of which may be either the *C. F. silvestris flore flavescente*, or some of the small leaved varieties, but I have not examined any of them.

Andowas, p. 89.

This seems undoubtedly another species of the *Cassia Fistula*, clearly enough marked by a lactescent bark.

Bilalangh, p. 89.

This may perhaps be rather a *Pterocarpus* than a *Cassia.*

Lignum Catudju, p. 89.

This is another valuable wood, the produce of a tree cul-

tivated in Macassar, and perhaps of the same genus with the *Bilalangh.*

KE ULE s. CAJU ULAR, p. 89.

This is evidently a species of the same genus with the *Cassia Fistula silvestris,* that is, having round each seed a corky arillus.

CAP. XXXII.

TAMARINDUS, p. 90, t. 23.

We have here an excellent account of this well-known tree. Of this, the *Tamarindus Americanus, siliqua fere orbiculata monosperma* (Phyt. t. 64, f. 4, a), and the *Tamarindus Bisnagaricus, siliqua productiore dispermos, seminibus veluti isthmo interceptis* of Plukenet (*ibid.* b), seem to be mere accidental variations.

CARANDJE s. CARANDJANG, p. 93.

Rumphius notices, that this had been confounded by Bontius with the *Carandas* of Garzia, and badly described, in having its leaves compared to those of the *Tamarind* (bipinnata), while, in fact, they are like those of the *Lingoa* (pinnata). Its legumen contains only one seed, surrounded by a quantity of pulp agreeable to eat. Plukenet (Mant. 177), has fallen into the same error with Bontius, in confounding this plant with that of Garzia; but the quotations from C. Bauhin and Imperatus probably belong to the *Carandje* of the Malays here noticed. This is a fruit of which I know nothing; nor do I find it mentioned in any modern work. It perhaps has some affinity with the *Cynomorium,* although its leaves being pinnated implies a different habit, more like the *Connarus.*

CAP. XXXIII.

MALUM GRANATUM, p. 94, t. 24, f. 1.

Of this plant, as of all others much cultivated, there are many varieties, but I suspect only one species; the characters by which Willdenow attempts to distinguish the *Punica nana* from the *P. granatum* (Sp. Pl. ii, 981), being quite insufficient. In warm climates the latter is always a bush, and its leaves may be called linear. The thorny plants, which Burman in his observation attempts to class with it, have no sort of affinity, being of the order of *Rubiaceæ*, nearly allied to *Gardenia*.

CAP. XXXIV.

LIMO DECUMANUS PRIMUS, p. 96, t. 24, f. 2.
LIMO DECUMANUS SECUNDUS, p. 97.
LIMO DECUMANUS TERTIUS, p. 98.
LIMO DECUMANUS QUARTUS, p. 98.

Burman properly observes, "arbores hæ—varietates potius sunt, quam peculiares species, unde—pro unica tantum habendæ sunt specie." I need hardly point out the absurdity of the notion entertained by early botanists, of this being the *Forbidden Fruit* in paradise; as it is entirely destitute of the qualities respecting the knowledge of good and evil by which that fruit was distinguished, and which has no doubt vanished from earth with paradise itself. The fruit, however, is so excellent, and has been so long patiently cultivated, that many more varieties than Rumphius enumerates are to be found, both in Asia and America, to which it has now spread. The varieties of this, indeed, and of the *Citrus Medica* and *C. Aurantium*, are so numerous, and run so into each other, that I doubt much if they can be considered as distinct species.

The characters, by which Willdenow attempts to distinguish these trees from each other, are, I am convinced, quite insufficient, being all often found in the same individual; nor have I been able to discover any certain character by which the *C. medica* and *C. aurantium* can be distinguished, if we exclude the taste of their fruit, which seems in fact to have been the distinction actually, although not avowedly, in the contemplation of Linnæus. Accordingly, M. Poiret (Enc. Meth. iv. 575, 578), called the *C. medica*, *Oranger acide*, and the *Citrus Aurantium*, *Oranger doux*; and observes, " aussi je n'assure que parmi les varietés que j'ai citées à le suite de ces deux especes, il ne s'en trouve qu'on puisse rapporter indifferamment à l'une aussi bien qu'à l'autre." This should certainly have prevented this author from making two species.

The attempt made by Risso, and adopted by Decandolle (Prodr. i. 539), to form five species from the *Citrus medica* and *C. Aurantium* of Linnæus, will, I am persuaded, be found abortive, although he admits into his specific characters mere varieties of form and taste in the fruit. What would be said of a botanist, who should attempt to divide the *Apple-tree* into a number of species from similar circumstances. Besides, these botanists attempt to found these five species on the various degrees in which the petiolus is winged, and on the leaves being blunt or sharp at the end, circumstances which, as I have said, will be found to vary in the same individual. Besides, what difference is there between a petiolus subalatus and a petiolus subnudus, by which M. Decandolle attempts to distinguish between the *Limonium* and *Aurantium*. The only character introduced by these botanists that deserves notice, is the number of stamina. I have not paid sufficient attention to this circumstance, in the various kinds found in India, to enable me to speak decidedly on the subject; and, so far as relates to

Rumphius, it will be impossible to refer his kinds to Decandolle's species, as he does not mention the number of stamina. In fact, this division into five species is an attempt to revive the division by C. Bauhin, being the same with his *Malus medica, Malus Limonia acida, Malus aurantia major*, and *Malus aurantia cortice eduli,* to which is added the *Limo dulcis*, commonly held to be a variety of the second kind. This subdivision may be very well suited to include the varieties commonly cultivated in Europe, but will be found inapplicable to those produced by long culture in Asia.

Provided it be thought proper to distinguish the *Citrus decumana* from the others, it may be done as follows:—

1. Citrus medica (et Aurantium) pulpæ in fructu vesiculis concretis.
2. Citrus decumana pulpæ in fructu vesiculis discretis.

This character, however, although always more or less distinguishable, is not so remarkable in the finer varieties of the *C. decumana*, such as those which grow at Canton and Batavia; and I doubt the propriety of separating into different species trees having such a strong resemblance to each other, on account of various forms, sizes, and qualities of a fruit, that has been long cultivated with the greatest care; nor does the fruit of any of the varieties of these three Linnæan species vary more from each other, than do different kinds of *Apple* (Malus). The great size of the *Pompelmoes* is no sort of proof of a distinct species; as both the *Santra* and *Jamir* of Gangetic India, which have an acid fruit, consisting of vesicles closely adhering to each other, which generally have a round petiolus, have a fruit fully as large as the *Pompelmoes.*

CAP. XXXV.

Malum citrium silvestre, p. 99, t. 25.
Malum citrium domesticum, p. 99.
Malum citrium silvestre alterum, p. 100.

CAP. XXXVI.

Limo tuberosus, p. 101, t. 26, f. 1?
Limo ventricosus, p. 102, t. 26, f. 2?
Limo unguentarius, p. 103.

CAP. XXXVII.

Limo agrestis, p. 104, t. 27.
Limo Taurinus, p. 105.

CAP. XXXVIII.

Limo ferus, p. 106, t. 28?

CAP. XXXIX.

Limonellus, p. 107, t. 29.
Limonellus Tsjamburaga, p. 108.

CAP. XL.

Limonellus aurarius, p. 109, t. 30.
Limonellus Madurensis, p. 110, t. 31.
Limonellus angulosus, p. 110, t. 32.

CAP. XLI.

Aurantium acidum, p. 111, t. 33.
Limo crispus, p. 112.

In the commentary on the 34th chapter, I have stated the difficulties attending a division of the plants of this genus into species, and that, in reality, Linnæus was entirely guided in the division by the taste of the fruit. I have, therefore, assembled here all those mentioned by Rumphius which have an acid fruit, and which therefore should come under one or other of the varieties of the *Citrus medica.* These, in fact, differ from the *Malus medica*, or first variety, having a very thick spongy skin, while that of the *Malus Limonia acida* is thin, and more solid.

In attempting to reduce the plants mentioned by Rumphius to these two divisions, I cannot satisfy myself, and shall therefore content myself by making two observations.

1. There is great reason to suspect that the reference to the plates by Burman, the editor, is in several cases erroneous, the figures and descriptions by no means agreeing. I suspect, therefore, that tab. xxxvi. f. 1, represents the *Limo unguentarius*, f. 2. the *Limo tuberosus*, f. 3. the *Limo Taurinus*, table xxxvii. the *Limo agrestis*, and table xxxviii. the *Limo ventricosus*, while there is no figure of the *Limo ferus.*

2. The *Limonellus angulosus*, from the difference of habit, having stipulary thorns growing by pairs, in place of single axillary thorns, is certainly of a different species, first introduced into the system by Willdenow, as the *Citrus angulosa* (Sp. Pl. iii. 1426), a species adopted by Poiret (Enc. Meth. sup. iv. 171), and Decandolle (Prodr. i. 540). I cannot rely much on the flowers in the figure being placed singly, and being of so small a size; for the flowers of many of the other species in Rumphius are represented equally small, although I know them to be as large as usual in this genus, and several are represented in terminal racemes, although no such inflorescence is known among these plants. These circumstances, therefore, in the figure of the *Limonellus angulosus*, not being mentioned in the description, may be fairly imputed to the error of the draughtsman; but the description of the fruit appears to point out that this

plant does not belong to the genus *Citrus,*—" Sub tenui cortice quatuor vel quinque plàna ossicula seminalia reconduntur in cellulis repletis viscoso succo instar visci." Now, in the genus *Citrus* there are more than one seed in each cell, and the cells are filled with a pulp contained in vesiculæ. On the whole, it seems more nearly allied to the *Limonia* or *Scolopia* than to the *Citrus.*

CAP. XLII.

Aurantium sinense majus } p. 113. t. 34.
Aurantium sinense minus }

CAP. XLIII.

Aurantium verrucosum, p. 115, t. 35.
Limon Pouleron, p. 116.
Aurantium pumilum Madurense, p. 116.

These are all the varieties of this fine tree, excluding the *Pompelmoes* or *Citrus Decumanus,* that in the eastern islands produce a sweet fruit. No doubt a vast number might be accumulated, were we to include all those of the different countries in which they grow; but, so far as I have seen, they may be reduced to the two kinds here mentioned by Rumphius; one with the rind easily separable from the pulp, and the other with these two parts closely united. Of the *Malus aurantia cortice eduli* of C. Bauhin, which forms Willdenow's variety β of the *Citrus Aurantium,* I know nothing.

The orange seems to be a very capricious plant, requiring something peculiar in the soil or situation to bring it to perfection. The tree thrives in every part of India; but, so far as I know, it produces good fruit in only four places;

Nepal, Silhet or Srihata on the eastern extremity of Bengal, Chandpur on the Brahmaputra, and Satgar at the foot of the Ghat Mountains west from Madras. What are the circumstances that render the fruit there so excellent, I cannot say; but no situations can be apparently more dissimilar.

On the whole, I am persuaded, that the five first species of *Citrus* enumerated by Decandolle, are only varieties of one tree; and I am doubtful, if even the *Citrus decumana* can be properly considered as sufficiently distinct.

CAP. XLIV.

MALUM INDICUM MAJUS, p. 117. t. 36.
MALUM INDICUM MINUS, p. 118.
VIDARA PUTI, p. 118.

These are to be considered as mere varieties of a plant often cultivated with care, and often growing spontaneously. In a commentary on the *Perim Toddali* (Hort. Mal iv. 85.), I have said all that seems necessary on the subject; only the synonyma, given in his observation by the editor Burman, require some more explanation. He here corrects the error adopted in the Thesaurus Zeylanicus (131, t. 61), in referring the *Perim Toddali* to his *Jujuba aculeata, nervosis foliis, infra sericeis*, flavis, which is the *Zizyphus œnoplia* of Willdenow (Sp. Pl. i. 1105), and the *Z. scandens* of Dr Roxburgh (Hort. Beng. 7.), who was probably deterred from quoting Burman, or recognizing the plant as the *Z. œnoplia* by every one of Burman's synonyma belonging to the *Z. jujuba*.

CAP. XLV.

Vidara littorea, p. 129, t. 37.

When Burman in his observation on the last chapter, corrected some errors, into which he had fallen in the Thesaurus Zeylanicus, he here fell into still greater. First he quotes as the same the *Jujuba indica spinosa folio et fructu longiore* of the *Thesaurus Zeylanicus*, and of Plukenet (Alm. 199), which belongs to the *Malum Indicum;* and next he quotes for it the *Prunus Zeylanica, spinosa, longiore folio viridi, fructus ossiculo orbiculari scrobiculis referto* of Plukenet (Phyt. t. 216, f. 6), which is no doubt a *Zizyphus*, but is the *Arbor spinosa Zeylanica foliis tribus nervis notata* of the Thesaurus Zeylanicus (29.) This is the real *Rhamnus Napeca* of Linnæus (Willd. Sp. Pl. i. 1104), as we learn from the Flora Zeylanica (87); although subsequent authors, copying Burman, confounded it with Plukenet's *Jujuba Indica spinosa folio et fructu longiore.* To complete the error, Willdenow, imitating the younger Burman (Fl. Ind. 60), quotes table 216, f. 6, by this last name. This error was first pointed out by M. Lamarck (Enc. Meth. iii. 319), who abandons altogether the *Rhamnus Napeca* of Linnæus, and describes (p. 320) a *Zizyphus Napeca*, a native of Egypt and Arabia, and called *Nabia* by the older botanists, from whence Linnæus no doubt derived the name *Napeca.* This change leads to confusion, as no doubt the *Arbor spinosa Zeylanica foliis tribus nervis notata* had been called *Napeca* by Linnæus, and is the only authority quoted in the Flora Zeylanica, although it probably is the same with that figured by Plukenet, t. 216, f. 6.

At any rate, however, we must exclude from the synonyma of both the *Napecas*, all those given by Burman in his Flora Indica, and by Willdenow, and especially the *Vidara littorea*, of which we are now treating. M. Lamarck indeed quotes it with doubt for his *Zizyphus Napeca ;* but I cannot think that it belongs even to the same genus. Its leaves, in place of having longitudinal nerves, have transverse ribs, and according to Rumphius, " capitula qualia prima sunt *caryophyllorum* rudimenta sese in flosculos aperiunt—ex quatuor albis et oblongis petalis constantes extrorsum reflexis, interne molli lanugine obvolutis instar serici, stamina quædam in centro gerentes." Neither does the description of the fruit agree well with the hard thick shell of the nut, and small seed of the *Zizyphus.* " Paucam gerunt carnem—includentes nucleum magnum oviformem in lignoso qui fragili putamine continetur, estque albus—sapore et substantia *Corylorum.*" On the whole I suspect, that it is more nearly allied to the *Elæagnus orientalis* (Willd. Sp. Pl. i. 689) than to the *Zizyphus.*

VIDARA LITTOREA MITIS, p. 120.

This probably belongs to the same genus with the preceding, whatever that may be.

CAP. XLVI.

LIGNUM COLUBRINUM TIMORENSE, p. 121, t. 38 ?

The first thing here to be remarked is, that the figure by no means can be reconciled with the description: for, first, it appears from the latter, that the leaves are regularly opposite, which is by no means the case in the figure. Next the fruit, according to the description, is smooth, ending above in a short but hard point ; but in the figure short spines are scattered over the whole surface, nor is there any appearance of a terminal point like the remains of the stylus. Finally the description says, "ramuli sine ullis spinis uti et tota arbor mitis est;" but in the figure there are spines in the forks of the smaller branches.

The next circumstance to be observed is, that Rumphius declares his plant to be quite different from three kinds of *Lignum Colubrinum* growing in Ceylon, from three kinds described by Christ. a Costa, and from some others described by Clusius, all of which farther are different from each other. Burman in the annexed observation, in a great measure, confirms this opinion; and after enumerating many plants, to which the name *Lignum Colubrinum* has been applied, and among others the *Caniram* of Rheede (Hort. Mal. i. t. 37), he considers, that the *Nux vomica major officinarum* of Herman in his Materia Medica, is the produce of the same tree with that here described by Rumphius. Notwithstanding this, he quotes the *Nux vomica major* of Paradisi Batavi Prodromus as being the same with the *Caniram*, and with the *Modira Caniram* (Hort. Mal. viii, t. 24). The Prodromus Paradisi Batavi, according to Linnæus (Flor. Zeyl.), is only supposed to be the work of Herman, and therefore the *Nux vomica major et officinarum* of this work, and of Herman's Materia Medica, may be different; so that Burman may be right in both cases; but little dependence can be placed on his accuracy, as, in the Thesaurus Zeylanicus, as above mentioned, he quotes the *Modira Caniram*, as the same with the *Caniram*, the one a large tree, and the other a climbing plant.

In treating of the *Tsjeru Katu Valli Caniram* (Hort. Mal. vii. 10. t. 15.), and *Modira Caniram* (Ibid. viii. t. 24), I have pointed out an error in Willdenow and Poiret, in quoting the figure of the first, under the latter name, for the *Strychnos Colubrina;* but Willdenow erred still farther, in quoting for this the *Lignum Colubrinum* of Rumphius, for both these *Canirams* are climbing plants, and Rheede calls the *Modira Caniram*, which is no doubt that meant by Linnæus, an herb; but Rumphius says of his *Lignum Colubrinum*, " arbor hæc vulgo altitudinem et crassitiem habet *Limonii Nipis*, in quibusdam vero locis instar *Limonii Itam*, quæ truncum gerit nempe crassitie hominis, vulgares vero non ultra crus sunt crassæ. Rami in minores et firmos dividuntur laterales ramulos." This clearly shows, that the *Lignum Colubrinum* is totally different from the *Strychnos colubrina*, although Poiret continues to quote it with doubt (Enc. Meth. viii. 695. The only doubt seems to be, whether or not it be a *Strychnos.* Its great bitterness, its opposite leaves with three longitudinal nerves, and the description of the fruit, lead to the supposition of its being a *Strychnos;* but the figure of the seed, consisting of two cotyledones without an albumen, contradict this opinion. I have however already said, that the figure seems to represent some other plant; and we may therefore conclude, that the *Lignum colubrinum* of Rumphius and the *Nux vomica major* of Herman are the same tree, not yet introduced into the botanical system.

AKAR LUSSA RADJA, p. 123. Actuar. p. 27.
AKAR LUSSA RADJA CRASSIOR, p. 123.

These may be of the same genus with the *Lignum colubrinum*, or perhaps one of them may be the plant represented in Plate 38?

CAP. XLVII.

RADIX DEIPARÆ MALACCENSIS, p. 124. t. 39.

Burman, in his annexed observation, considered this as a *Rhamnus;* nor has any subsequent author quoted it; but I understood that Dr Roxburgh considered it as his *Gmelina villosa* (Hort. Beng. 46), although it is not quoted, and although in the *G. villosa,* which I saw in the Botanical Garden at Calcutta, from whence I have sent specimens to the India-House, I observed no leaves lobed, as some of those in the figure are. In other respects, however, it agrees sufficiently, and, coming from the vicinity of Malacca, is probably the same. There can, I think, be no doubt, at any rate, of the *Radix Deiparæ* being a *Gmelina.*

RADIX DEIPARÆ CELEBICA LOWARA DICTA, p. 125.

From the large size and hardness of the wood in this tree, it is probably the *Gmelina arborea* (Hort. Beng. 46) or *Cumbulu* of Rheede (Hort. Mal. i. 75, Lin. Trans. xiii. 511.), specimens of which I have sent to the India-House.

RADIX DEIPARÆ SILVESTRIS, p. 126.

This is probably the same species with the plant of Malacca, that is the *Gmelina villosa,* but has no extraordinary virtues ascribed to it, as it grows in places not reckoned holy.

CAP. XLVIII.

RADIX DEIPARÆ SPURIA, p. 127. tom. i. t. 40.

In the Commentary on the *Jambosa silvestris parvifolia* (H. A. i. p. 129.), I have already mentioned the mistakes occasioned by a transposition of plates, t. 40. of this volume, having been interchanged for the 40th plate of the 1st volume, which accordingly represents the *Radix Deiparæ spuria*, and has been properly quoted by Willdenow for the *Gmelina asiatica* (Sp. Pl. iii. 313.), although by a wrong name.

Puzzled by this transposition, Burman, in his explanation of the plate given in this volume, considers the *Radix Deiparæ spuria* as belonging to no known genus, although he himself had noticed the plant (Thes. Zeyl. 197) calling it *Prunus Indica sylvestris, fructu flavo pyriformi, Dematha Zeylonensibus.* Respecting this plant, indeed, he was very unfortunate, as he confounded it with the *Tani* of Rheede (Hort. Mal. iv. t. 10.)

This error was pointed out by Linnæus (Fl. Zeyl. 230), but he did not recognise the *Radix Deiparæ spuria* in the *Dematha* of the Ceylonese, which had been described by Amman by the name of *Michelia.* Linnæus, however, chose to transfer this name to another genus, and gave the name *Gmelina* to the *Dematha.* At the same time he quoted as the same two plants, considered by Plukenet as different from each other, the *Lycium Maderaspatanum Indici Alpino putati æmulum foliis, minoribus, bijugis et grandioribus, aculeis horridum* (Alm. 234.; Phyt. t. 97. f. 2.), and Idem foliis majoribus (Phyt. t. 305, erroneously called 303. by Linnæus, f. 3.) The latter seems to me more like an *Ardouina* or *Carissa* than a *Gmelina*; and the former, if it be a *Gmelina*, is rather the *G. parvifolia* of Roxburgh (Hort. Beng. 46), than the *Dematha* now called *G. asiatica* (Burm. Fl. Ind. 132), provided these two species are sufficiently distinct. Nothing, indeed, belonging to one genus, can be more different in appearance than certain individuals of the two kinds; but the form and size of the leaves, and even the growth of the stem, differs so much in different individuals, known by culture to be of the same species (as may be seen in the specimens sent by me to the India-House), that I doubt the propriety of distinguishing them, unless Dr Roxburgh has pointed out some essential difference in the more important parts, which I did not notice. One thing certain is, that neither is a tree, as Linnæus asserted. Rumphius says, "frutex stipitosus, qui sese sursum explicat in longos et flagellosos ramos." M. Lamarck was the first to refer the *Radix Deiparæ spuria* to the *Gmelina asiatica* (Enc. Meth. ii. 739.), but he did it in the same erroneous manner with Willdenow, only he says plainly, that he refers to the figure (H. A. i. t. 40) alone, the description of the *Jambosa silvestris parvifolia* having no resemblance.

CAP. XLIX.

Rex Amaroris, p. 129. t. 41.

Burman, in his annexed observation, considered this as of the same genus with his *Ligustrum foliis ad singula internodia ternis* (Thes. Zeyl. 141. t. 64); but nothing can be more different in appearance, and he seems to have been guided entirely by their supposed medical qualities. M. Lamarck (Enc. Meth. i. 449) was the first to bring this plant into the modern system, calling it *Soulamea amara;* but, owing either to the imperfection of his description, or to the nature of the plant, Jussieu (Gen. Plant. 469) did not reduce it to any of his natural orders. M. Poiret (Enc. Meth. Sup. v. 191), however, places it among the *Polygaleæ*, in which he is followed by Decandolle (Prodr. i. 335), although it seems almost certain that it does not possess the characters by which the latter defines this order.

CAP. L.

Anisum Moluccanum, p. 132. t. 42.

In the annexed observation, Burman considers this as evidently one of the *Umbelliferæ*, and as a species of *Orcoselinum* or *Bubon*, according to Linnæus. In this opinion M. Lamarck seems to coincide (Enc. Meth. ii. 715), although he admits that it may be a *Panax*, and thus belong rather to the *Araliæ* than to the *Umbelliferæ*. This latter opinion seems the more tenable of the two, as in the figure there is no appearance of a regular umbella; but both seem to be founded on the supposition of their being two seeds in the fruit (ses fruits etant, à ce qu'il paroit, de baies arrondies et dispermes). This, however, seems doubtful. We may indeed suppose that two berries succeed each flower (fructus—bacca est subrotunda minor grano Piperis, gemina sibi opposita, tuberculosa instar minimorum *limonellorum*), and he adds "Maturi vero hi fructus—sub tenui pellicula semen gerunt nigrum instar *Coriandri*." Now, I consider this as referring merely to the size of *Coriander* seed, and not to its structure. What, however, in my opinion, is decisive against the *Anisum Molluccanum*, belonging either to the *Umbelliferæ* or *Araliæ* is, that the germen would appear to be above the calyx or corolla; "flosculi pentapetali albicantes parumque excavati instar *Lilii Convallii*, qui in centro gerunt pistillum, quod in fructum excrescit." It is to be observed also, that Rumphius does not notice any stamina, which, so far as we can depend on his care, implies the flowers being dioecious.

On these accounts, as well as on the habit of the plant, I am inclined to think it one of the *Rutaceæ*, and probably a *Zanthoxylum*, as defined by M. Decandolle (Prodr. i.

725). Indeed, it may possibly be his *Z. armatum* (ib. 727), for which he quotes the Hortus Bengalensis (72); but the only *Zanthoxylum* mentioned there is called *alatum*. The plants are, however, probably the same, the difference of name having arisen from some error in writing or reading the tickets annexed to a specimen. I know nothing, however, of either plant, and judge merely from the specific character given by M. Decandolle.

BOA BALANGAN, p. 133. t. 43.

This plant, Burman, in his observation annexed, called *Anisifolium*, and by this name it is usually quoted, although the term was unknown to Rumphius. In a Commentary on the *Isjerou Katou Naregam* (Hort. Mal. iv. 31), I have explained fully my ideas concerning it, and I have only now to remark, that, having since obtained M. Decandolle's most valuable Prodromus, I find him (tom. i. 536) following the error introduced by Koenig, and calling this the *Limonia acidissima*, although he retains the *Feronia elephantum* (Prodr. i. 532). Koenig was probably led into the error, of considering his *Cratæva Balangas* (*Feronia elephantum*, Correa, Lin. Trans. v. 224) as different from the *Anisifolium*, by the small size of the fruit, in the figure given by Rumphius; but this is evidently an error of the draughtsman, as Rumphius says that the fruit is as large as that of the *Bilac Tellor (Ægle marmelos)*; and the very name *Balangas* ought to have satisfied him that his plant was the *Boa Balangan* of Rumphius.

CAP. LI.

SAPONARIA, p. 134.

In a Commentary on the *Poerinsii* (Hort. Mal. iv. 43), I have explained my ideas concerning this plant, which I consider as the same. Since writing that Commentary, I have procured the Prodromus of M. Decandolle, and observe, that although many of my opinions respecting the *Poerinsii* coincide with his; yet that he thinks the *Saponaria* of Rumphius different, and calls it *Sapindus Rarak* (Prodr. i. 608), distinguishing them by the *Rarak* having from ten to twelve pair of pinnæ in each leaf, while the *S. laurifolius* has only three pair. I have some doubt how far we can rely on this point, the number of pinnæ being liable to great variation in different parts of the same individual, and in the same individual at different ages: thus, Rumphius says, that in young plants the leaves have twelve or more pairs of pinnæ, while old plants have only eight or ten; and I have mentioned in the Commentary already cited, that the leaves of the *Poerinsii* adjoining to the flowers, are only ternate. I have not, however, taken any note concerning the number of leaflets in parts of the tree at a distance from the flowers, or in young plants.

CAP. LII.

Pharmacum Sagueri legitimum, p. 136. t. 44.
Pharmacum Sagueri limonicum, p. 137. t. 44. f. B.

These seem evidently plants of the same genus; nor is it clear, indeed, from what Rumphius says, that they are different species, although, as neither is cultivated, and as they possess different qualities, there is probably in some of their parts an essential difference, which escaped the notice of Rumphius.

So far as was known to M. Poiret (Enc. Meth. v. 258) no botanist since the time of Rumphius, has noticed these trees, nor have I any knowledge of them. M. Poiret, I have no doubt, mistakes the meaning of Rumphius concerning their use: a fermented liquor is no more made from the root of the *Sesoot*, than beer is made from *Hops*. The fermented liquor is made from the sap of the *Saguerus*, and the root of the *Sesoot* is used to regulate the fermentation, so as to make the liquor keep, and to give it an agreeable bitter flavour.

So far as I can understand Rumphius, the leaves are bipinnated, and therefore the figure represents only one leaf. This supposition is, however, by no means certain, as he compares its foliage to that of the *Clove*, which has opposite branches and leaves. If the leaves are simple, like those of the Clove, or even pinnated, they must be opposite; and were it not for this, from the account by Rumphius of the fruit, I should have taken the plant to be a *Connarus;* but, if the leaves are bipinnate, it is more likely to be an *Inga;* nor is its quality in regulating the vinous fermentation unknown in plants nearly allied to this genus; for the bark of the *Mimosa leucophlea* (Roxb. Hort. Beng. 40) is used for this purpose (Buchanan's Mysore, i. 39); and a clear viscid liquor, such as is described by Rumphius, is contained between the seed and external parietes of the fruit in several species of the *Leguminosæ*, belonging to the genus *Cæsalpinia.*

CAP. LIII.

Capraria, p. 139.

There being no figure, nor any account of flower and fruit, it is impossible to say what this plant may be, but it has pinnated leaves.

CAP. LIV.

SONGIUM, p. 140. t. 45.

In a Commentary on the Syalita of Rheede (Hort. Mal. iii. 339), I have said most of what occurred to me on the subject, as I consider the *Songium* to be the same tree. M. Decandolle does not quote the *Songium* for either *Dillenia speciosa* or *elliptica*, but it evidently agrees better with his specific character of the former, than with that of the latter, the only difference between them being in the words foliis elliptico-oblongis applied to the *D. speciosa*, and elliptico-ovatus applied to the *D. elliptica*, differences, in my opinion, too trifling to deserve notice. Rumphius mentions three varieties of this tree, which, being a good deal planted near villages, is liable to assume various forms; one has sweet, another sour fruit, and another is sterile, producing no fruit. I have never, however, noticed any tree, that produced male flowers alone, although such may very readily exist. In this case the plant belongs to the *Polygamia dioecia*.

SANGIUS MAS et FŒMINA, p. 142. t. 46.

Rumphius erroneously referred this to the *Syalita* of Rheede, from which, however, it is sufficiently distinguished by its peduncules having three yellow flowers. That the *Songium* or *Syalita* is diœcious, I have already stated, is probable; but that the *Sangius* is so, from the description given by Rumphius, is certain, and nothing seems to be known of the plant, except what he says; yet Thunberg (Lin. Trans. i. 201), by whom it was introduced into the modern system by the name of *Dillenia serrata*, takes no notice of this circumstance; and M. Poiret (Enc. Meth. vii. 151), and Decandolle (Prodr. i. 76), are equally silent.

XII.—*On the Anatomical Peculiarities of the Sturgeon ;* (Acipenser Sturio, L.)

By David Craigie, M. D. Extraordinary Member, and formerly President, of the Royal Medical Society, Edinburgh.

(Read 3d April 1830.)

Having, through the kindness of Professor Jameson, enjoyed an opportunity of dissecting a specimen of the Sturgeon, I have reason to believe that an account of its anatomical peculiarities may not be entirely void of interest. This will appear so much more necessary when I state, that, notwithstanding the diligence with which comparative anatomy has been cultivated, no very satisfactory description of the anatomy of the order of the finny tribes to which the sturgeon belongs has yet been given ; and the short notices which we find in the writings of the late Dr Monro and Sir Everard Home, are calculated rather to excite than to gratify rational curiosity.

The circumstances under which my examination of the animal took place, confined my inquiries chiefly to the alimentary canal and the urinary organs ; and to these, therefore, the present notice shall principally refer.

It may not be improper to premise, that the Sturgeon *(Acipenser Sturio* of the Linnean arrangement), is an inhabitant of most of the large rivers of Europe and the north of

Asia. In the Don, the Wolga, and other rivers of European and Asiatic Russia, it is the object of an extensive commercial fishery, for the purpose of manufacturing isinglass and caviare, which last is the preserved roe of the female. In the rivers of this country, though less frequently, it is occasionally met with; and the animal has been long known among the peasantry of Scotland, and, if I mistake not, of England, under the name of Stoor or Sture. This word, which is said to be of Gothic origin, is perhaps common to several of the ancient northern dialects, is the undoubted parent of the term *Sturio*, which was unknown to the better periods of the Roman language, and may be regarded as one of the few genuine remains of the pure Anglo-Saxon common to the English and Lowland Scottish. It is certain, at all events, that a manifest affinity, or rather identity, may be traced between it and the Stör of the German and Lower Saxon, the Steur of the Dutch, and the Stoͤr of Sweden; all of which seem to be sprung from the Cimbric adjective Stor, still extant in the Islandic, and signifying large or immense. Among the Roman authors, the sturgeon appears to be distinguished either by the name of *Silurus* or *Acipenser;* and the more barbarous and equivocal denomination of *Sturio* was adopted by the Latin of the middle ages from some of the Celtic or Gothic nations, to whom the animal was well known.

The specimen which formed the subject of my examination had been caught, near the Isle of May, in the Firth of Forth, by some fishermen, in whose nets, cast for catching skate and other fish, it had been involved. The whole length of the animal measured from the snout to the tip of the tail 5 feet 11 inches. Its breadth at the shoulders was fully 14 inches. The length of the adult varies from 10 to 15 feet; and this, therefore, must have been a young animal.

The alimentary canal consists, in this animal, of an œsophagus, a stomach, or membranous bag with two curvatures, a duodenum, or cylindrical tube with one curvature, and a straight cylindrical tube answering to the intestine proper, or the ileum and colon combined. In dimensions these several parts were nearly as follows:

	Length.	Circumference or Breadth.
Œsophagus, .	6 inches	3½ inches
Stomach, .	25½	6–7
Duodenum, .	31½	4–3½–& 2½
Intestinal tube,	24	3½–4

The œsophagus is a cylindrical tubular organ, extending from the posterior part of the throat downward, and slightly to the left, about 6 or 7 inches. In diameter it varies from 1½ to 2 inches. When cut open by a longitudinal incision, the whole breadth of the tube is 3½ inches, which may be regarded as equivalent nearly to its average circumference. Its parietes are membranous, varying in thickness from 2 to 3 lines—diminishing, however, when the tube is stretched. The substance of this tube consists of three distinct tissues. The external is a sort of tendinous fascia, with longitudinal fibres particularly distinct along the posterior part of the tube. Beneath this is a layer of muscular fibres, disposed in a circular direction round the tube, and constituting with the connecting cellular tissue the greater part of its substance. Within this again is placed the proper œsophageal membrane, a firm tenacious substance of pearl-white colour, quite opaque, and half a line thick.

The free surface of this latter membrane is projected into numerous conical and pyramidal *papillæ*, which rise above its level to the extent of a line, or a line and a half, and a few tubercular eminences, not quite so prominent, but with the former rendering the inner surface of the œsophagus rough and irregular. The disposition of these pyramidal eminences and tubercles may be said to be both in transverse and in longitudinal rows. Of the latter, three are very distinct, and are separated by long furrows, the surface of which, as of that of the intervals between the eminences, is smooth, and of a more decided opaque pearly colour than the other portions of the membrane. Most of the papillæ have acuminated apices, and some are bifid. They are firm and semicartilaginous in consistence. (Pl. IV. Fig. 1.)

These papillæ are evidently intended to contribute to the mechanical division of the food. The sturgeon is destitute of teeth, and consequently swallows his food entire. The œsophagus contained, in the case of the individual dissected by me, several small fishes of the sand-eel genus (*Ammodytes Tobianus*), which had been swallowed entire, and were destined, in all probability, to undergo a preliminary mechanical digestion in the interior of the tube. The thickness of the muscular layer shews that it possesses considerable contractile power; and it is easy to see that the papillæ and tubercles of the inner membrane, if forcibly rubbed against articles of food by this powerful agent, must quickly reduce them to fragments fitted to enter the stomach, and undergo the chemical solution of that organ.

At the same time, I do not feel myself quite justified in asserting, that this apparatus must divide the food previous to its transmission into the stomach; for, in the latter organ, amidst much digested and dissolved food, were found also several small fishes, apparently sand-eels, still in a state of great integrity.

These conical papillæ and tubercles, nevertheless, with the opaque pearl-white aspect of the inner membrane, constitute the most distinct anatomical character of the œsophagus. The points at which they cease indicates the termination of the latter tube, and the commencement of the stomach; and they may, in this respect, be regarded as affording one of those analogical proofs of the cessation of the epidermis at the cardiac extremity of the œsophagus, which the anatomist finds in the animal kingdom at large: For, though the texture and appearance of this membrane are so different in the sturgeon and fishes generally, from what we find them in quadrupeds, yet the transition from the pearl-white, opaque, tuberculated membrane of the œsophagus to the fawn-coloured, villo-mucous membrane of the stomach, is so well marked that it cannot escape the most superficial observation. (Fig. 1. C).

The upper extremity of the œsophagus, on its posterior surface, is connected by ligamentous slips to two of the lobes of the liver. With this organ, however, there is of course no communication. The tube is also fixed to the anterior surface of the vertebræ and incumbent muscles, by means of cellular tissue. The superior or pharyngeal end of the tube communicates with the mouth; the lower or cardiac opens into the stomach.

The latter organ, which now comes under examination, is, in the sturgeon, a large musculo-membranous bag, of a shape somewhat fusiform, or like the oblong spheroidal figure of a distaff. Its entire length, in the specimen before me, measures 25 or 26 inches, but it underwent a curvature about 11 or 12 inches from its cardiac or œsophageal end. Narrow at the cardiac and pyloric extremities, it bulges, about an inch or two below the former, into a large sac, with a diameter of at least 5 inches. In this state it descends, and passes a little to the left side of the vertebral column, for about 10, 11, or 12 inches, forming a large and capacious sac, which may be regarded as the cardiac or larger division of the organ in which the first part of the process of digestion is performed. From this point, after a slight bend upwards, the organ continues obliquely upwards and towards the right side, crossing completely the mesial plane. At the curvature now mentioned, the organ begins to contract, and continues diminishing till it rises nearly to the level of the cardiac orifice, when it tapers, and, becoming conical, takes another bend, in order to form the pylorus and its valve. The portion of the organ included between the curvature and the pyloric outlet, may be regarded as the pyloric or second division of the stomach.

When cut open, the breadth at the orifice of the sound or swimming-bladder, which is about two inches below the cardia, is six inches exactly; and, a little below this, it amounts to seven inches, which may be regarded as the greatest breadth of the gastric membrane. From these measurements, however, it is impossible to calculate exactly the capacity of the organ; for it is evidently very distensible, and had contracted greatly after being laid open; and, while the circumference now stated gives an average diameter of 2½ inches only, I think it is likely, from the folds which, in the recent state, the inner membrane presented, that the caliber of the organ is at least four inches, and occasionally six or seven.

The parietes of the stomach are thinner and more membranous than those of the œsophagus; and, while its interior is formed by a thin transparent membrane, corresponding to the peritoneum of the mammalia, the middle consists of a layer of circular muscular fibres, lined on its interior by a villous membrane of no great thickness, but firm and tenacious. Of this latter membrane, the most remarkable peculiarity is, that it is gathered into longitudinal folds, extending from the cardia to the pylorus, not dissimilar to those of the Red or fourth stomach of the ruminating tribes.

This membrane is villous in structure and mucous in properties. Its surface is smooth and velvet-like, of a fawn-colour, approaching to Sienna-yellow*, and it is nearly quite opaque; at least it does not allow the muscular coat to be recognised through it, and it cannot be even denominated translucent, chiefly perhaps in consequence of the white opake corion. To the muscular coat it adheres by part only of its attached surface. The unattached parts are those which correspond to the folds, and which are mutually applied without adhering to each other. The free surface is, as I have already stated, formed into several, perhaps a dozen, of longitudinal folds, which project, but do not hang loose into the cavity of the organ. The result of this arrangement is, that the mucous membrane is greatly more extensive than the muscular tunic and the peritoneum; and its free surface presents an extent double, if not treble, of that which it would, if void of these folds. They were quite distinct in the recent state; but, since the stomach was divided, they have entirely disappeared, so that the mucous surface is entirely uniform.

Though I am averse to the introduction of speculations on the uses of particular arrangements in the description of mere anatomical facts, it may nevertheless not be altogether unseasonable to observe, that the provision of *plicæ*, or folds, of the gastric mucous membrane, is not only connected with the anatomical fact of increasing the extent of surface, but is probably intended to allow the membrane to undergo a much greater degree of distention, than it could with safety, if void of these duplicatures. The stomach is an organ liable at all times, and in all classes, to great and rather sudden changes of capacity; and, from the voracity of fishes, which gorge, in general, until not only the stomach, but the œsophagus, is actually crammed to the throat, this viscus is, in these animals, occasionally stretched to a very great degree. When the muscular coat is stretched, if not beyond its bounds, it naturally contracts when the distending cause ceases to operate; and even the distention, in this case, is not altogether unfavourable to its action. The peritoneum also, we know from the phenomena of uterogestation, is both distensible and contractile. With the mucous membrane, however, it appears to be different; and the only mode by which this tissue seems with safety to undergo alternate distention and contraction, is by its being provided with greater actual extent, and by the contractile power of the enclosing muscular layer, drawing it into folds of various size and in different directions. The reason why these folds are longitudinal in the sturgeon, is, that the muscular layer is arranged in circular fibres round the axis of the stomach.

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* Here I may mention once for all, that, in speaking of the colours of parts, I use the nomenclature and distinctions of Werner as modified by Professor Jameson in the useful tract of Mr Patrick Syme of this place.

Towards the pyloric end the villous coat becomes firm, and the muscular layer acquires extraordinary thickness and strength, approaching to fully half an inch of solid muscular substance, at one inch from the pyloric termination. At the same time the organ contracts, tapering like the apex of a cone, and, after making a slight bend, forms the pyloric orifice, which terminates in the duodenum by a valvular opening of peculiar figure and structure. This consists in the muscular and mucous tissue being contracted into a tubular opening, so much that the tip of the little finger may be inserted from the gastric end, but cannot be carried through. This opening, indeed, is so small, that it allows only a good sized pencil to be introduced. The pyloric opening is thus formed into an annular tube, which not only, by a further bend, completes the arch partially formed by the contracting portion of the organ, but projects like the nozzle of a stop-cock into the next bowel. (Fig. 2. Π).

It is almost superfluous to say, that the stomach communicates above with the œsophagus, and below, by the orifice now described, with the duodenum. In addition to these ordinary communications, it also opens into another cavity, that of the sound or swimming-bladder. On the left side of the stomach, about two inches below the cardiac orifice, there is a circular or elliptical opening, as large as half-a-crown, proceeding into a cavity, which is that of the sound. The margin of this circular orifice is provided with a row of fringe-like papillæ, which consist of mucous membrane enveloping muscular fibres. These papillæ do not appear very distinctly on the gastric side of the orifice (Fig. 1. O), which appears rather under the form of a circular hole, with mucous membrane puckered into folds. When examined from the sound they are large and distinct, and are even larger and more prominent on one margin of the aperture than the other (Fig. 4). These apices, which are broad, project into the sound, not into the stomach; and, as they are chiefly muscular in structure, it is not improbable that they are either in some degree under the will of the animal, or associated with some of the motions of the voluntary organs. If these papillæ act as a sphincter valve, which is not improbable, they may allow the entrance or exit of air, while they exclude the food. In the present instance, the swimming bladder contained, with some water, a little of the pulpy matter which was found in the stomach. It was otherwise flaccid.

The stomach is attached above to the vertebral column, to part of the sound, and on the right side to two of the lobes of the liver, and by means of the spleen to the duodenum.

The next bowel corresponds to the duodenum of the human subject and the mammalia, but cannot be so denominated with justice, since it is not less than 31 inches long. In anatomical character and physiological properties, however, this bowel corresponds so perfectly with the human duodenum, that it may be adduced as a good example of the impropriety of naming organs from their dimensions only. It is a complete *ventriculus succenturiatus*, or secondary stomach. The characters on which it is entitled to this distinction are, 1*st*, its connexion with the pyloric end of the stomach; 2*d*, its reception of the biliary duct; 3*d*, its connexion with the pancreatoid organ, which has generally, but not very properly, been named *appendices pyloricæ;* and, 4*th*, the peculiar curvature which it takes, something below the middle of its course. In one character only, that of being attached to the spleen, does it differ from the human duodenum; but this is too trivial a circumstance to be allowed any weight as an objection. (Fig. 2. △ △).

This secondary stomach, then, or duodenum, may be described as a cylindrical tube, bent at an acute angle on itself, situated between the pyloric end of the stomach and the upper end of the intestinal tube. From the former point it proceeds downwards, and towards the left, for the space of 18 inches, when it makes a quick bend, and ascends obliquely in the opposite direction for 13½ inches, when it unites with the intestine proper. Its calibre, before division, scarcely exceeded 1 inch. After being laid open, its average breadth was about 4 inches. At the angular bend it was only 3½; and, though it widened again below this, it contracted at the inferior extremity, and became not more than 2½ inches, making the caliber of this part not so much as one inch.

In structure, this part of the alimentary canal differs considerably from the œsophagus and stomach. The exterior membrane, indeed, like that of the latter, is peritoneum; and between this and the inner membrane there is interposed a layer of muscular fibres, with circular disposition, about three lines, or $\frac{1}{3}$ of an inch thick, and giving proportional firmness to the intestine. But the internal membrane is very different in appearance and physical characters; on the first sight it appears like a honeycomb net-work of smooth fibres intersecting each other, and forming large pentagonal meshes, or cells; and this arrangement unquestionably it was which induced the late Dr Monro to denominate this of the sturgeon *reticular*. It is not worth while to dispute the propriety of this as a general character of the appearance which the inner surface of the duodenum presents. I shall rather endeavour, by precise description, to communicate as distinct an idea of it as possible; and, when the arrangement is understood, it is of little moment by what name it is denominated.

A given space of this surface, when minutely examined, is found to consist of numerous bands of animal matter, about the breadth of derning needles, and round and smooth on the surface, intersecting each other in directions not very definite, but so as to form a series of trapeziums and irregular pentagons. These bands may be considered as primary. The trapezoidal and pentagonal spaces which they enclose, present again surfaces intersected in like manner by much more minute bands, some not exceeding the size of sewing needles, and some as minute as hairs. The interstices of these intersecting or reticular bands, are of various sizes. Those of the primary walls are from $1\frac{1}{2}$ to 2 lines in superficial extent; those of the secondary bands are so small, that they scarcely admit the point of a silver probe; and some are so minute, that the head of a common needle only can be inserted into them.

At my first examination of this structure, I imagined that the large or primary bands might be elevated from the surface of the membrane, by means of a blunt instrument inserted beneath. This, however, I find not to be the case. They are tied down, as it were, by minute thread-like bands, similar to the small capillary ones; and which, like the latter, contribute to the formation of the minute reticular texture.

Of the nature of the substance of these intersecting bands, I scarcely feel competent to speak with confidence. Analogy would lead us to suppose, that they are similar in structure to the villo-mucous membranes. I must nevertheless say, that they have a redder and more fleshy appearance, as well as a firmer consistence, than any form of villous membrane with which I am acquainted. There is further no appearance of *villi*, or piles, such as are found in the intestinal tube of the mammalia, birds, and some reptiles. This tissue is short in the inner surface of the duodenum of the sturgeon, while dissimilar to that of the duodenal membrane in other classes of animals, bears a nearer resemblance to that of the inner surface of the auricle of the heart, than to any other part of the animal body. The individual bands, or *fasciculi*, are perfectly smooth, so that, however irregular the surface may seem, its component parts are highly polished. The bowel was found filled with food in the state of chymous pulp. When this was removed, the interstitial cavities were occupied by a good deal of mucus, which, however, was easily washed off by pure water.

The upper or gastric extremity of the duodenum is remarkable for three orifices which open into it. The first of these is the pylorus already noticed, and on which, therefore, I shall not dwell any longer. The second is an excreting duct, which must be more particularly mentioned.

Situate in a sinus or cavity behind, and a little to the right of the pyloric opening, is a small nipple-like process, which projects into the surface of the membrane about 1 line. The extremity of this process contains a minute orifice, which simply admits the point of a common-sized probe. This is the opening of the biliary duct. In the instance before me, though the probe entered, I found it impossible to carry it upwards into the gall-bladder, without using more force than I thought expedient; but, when introduced from the gall-bladder, it went without difficulty into the duodenum, a circumstance which I ascribe to the transverse folds almost invariably found in the inner membrane of the common duct.

On the opposite side of the pyloric opening, in a similar sinuous recess, is seen an orifice much larger, sufficiently so, indeed, to admit the tip of the middle finger. This opening leads into the interior of a large triangular-shaped organ, situate on the outer side of the bowel, and having the appearance of a pancreas. This organ it would be improper to describe at present, were it not almost manifest that it performs an important and essential part of the process of digestion. Though differing from the other parts of the alimentary canal, in not possessing the cylindrical shape and the tubular disposition, and in having no outlet, yet, as it contained part of the alimentary mass, and as its interior is lined with the same membrane as that which covers the duodenum, I think I am justified in arranging it in the mean time with the latter organ.

This body, then, which for want of a better name, I am obliged to term the *pancreatoid*, is of an irregular triangular shape, of a fleshy appearance, and of a bluish colour, or rather greenish-black, with pansy-purple, interspersed with whitish or white-grey spots. Its consistence is firm and solid, a circumstance to be ascribed to the thickness of its parietes, which are at least half an inch, often more than a whole one. Its outer free surface is covered, as the other abdominal organs, with peritoneum. The internal, I have already said, is a membrane of the same physical and anatomical characters as that of the duodenum. Between the two is interposed a mass of firm fleshy substance, of a greyish-white colour, and which resembles a good deal the substance of the uterus of mammiferous animals. (Fig. 2. P).

The internal arrangement of this body is very singular. The orifice which leads to it from the duodenum very soon diverges into several similar orifices; and, when these are exposed by suitable sections, they are found to terminate in spherical and spheroidal cavities, in which are found similar orifices leading to similar cavities. Though I call these cavities spherical or spheroidal, I mean not to say that their shape is strictly so; and indeed it is difficult accurately to determine the form of these cavities, which vary in this respect according as one communicates with few or more of them. Thus, after laying open the organ by a section directed laterally outward, a pretty large space, of an irregular figure, but containing four or five orifices, is exposed. When the section is prolonged into one or more of these openings, their shape is found still to vary according as they present other openings in smaller or greater number. While this organ, in short, possesses no general cavity, its interior is moulded into a series of communicating cells, separated by partitions of the substance proper to the organ, and each of which, to the remotest recess, is lined by the honeycomb or reticular membrane, which is continued from the duodenum.

A still more remarkable peculiarity is, that these communicating cells have no outlet or vent, and communicate with the cavity of the intestinal tube by the duodenal opening only. In the specimen of the sturgeon dissected by me, they were filled with alimentary matter in a pulpy state, and of the same consistence and physical characters as that in the duodenum. From the arrangement now mentioned, it results that this alimentary matter cannot escape from the cells by any other route than that by which it had entered them.

On the nature and uses of this peculiar organ, it is reasonable to make some inquiry ; but hitherto little satisfactory information regarding it has been communicated. The zootomists by whom the organ has been noticed, have been satisfied either with admiring its peculiarities of structure, or with drawing some vague comparisons between it and the pancreas of warm-blooded animals. The first work, I believe, in which this subject receives any attention, is the Observations of the Amsterdam physicians, ascribed chiefly to Swammerdam, in which they are named *Appendices Pyloricæ*, and are supposed to secrete a fluid which exercises considerable influence on the process of chylification. The denomination is not very happy ; for though, in some fishes, they open at the *pylorus*, or lower end of the stomach, in a much larger proportion they are placed at the beginning of the duodenum, with which they communicate, and hence would merit rather the epithet of Duodenal Appendages.

The next work in which this structure is remarked, is that of Samuel Collins, an anatomist who, for diligence in prosecuting the study of zootomy, and recording several curious facts regarding the structure of the lower animals, compared with that of the human subject, deserves to be more generally known than he is *. This author mentions shortly in his description of the intestinal structure of fishes, parts of the alimentary canal, to which he gives the name of *intestina cœca*, or blind guts; that is, bowels without vent; and of these he delineates examples in the perch, the rocket, the eel-pout, the grey mullet, the red mullet, the gurnet, the whiting, and the *asellus virescens*,—a variety, I believe, of the whiting. In these genera of the finny tribes, the *cœca* are numerous, varying from 6, 8, or 10, to 17, 20, or even 100 in some instances. They are in the shape of long processes which hang loose from the secondary stomach, not unlike fingers; and, when not very numerous, they popularly receive the name of hand or foot, as in the case of the burbot, the *Gadus Lota* of Linnæus, the *Lota fluviatilis* of M. Cuvier and Mr Stark. This may be considered the first form of the part of the alimentary canal at present under consideration.

The same author, in a subsequent part of his work, describes, in the same situation, under the name of Pancreas, an organ, sometimes triangular, sometimes like a battledore, but always containing glandular cavities, and secretory ducts. Collins, at the same time, mentions the fact as ascertained by the Amsterdam anatomists already referred to, that, in some fishes, as the cod, it is possible to enumerate 249 appendages, terminating in 40, and occasionally in 70 trunks, which discharge pancreatic liquor by six ducts into the intestinal canal. Waiving entirely the circumstance of discharging pancreatic liquor, which is a mere assertion, and may or may not be true, there is no doubt that the *cæca*, and the so named pancreas, are really varieties of the same form of organization. That the *intestina cæca*, or pyloric appendages, and the pancreas, or pancreatoid organ, are truly to be referred to the same parts, is proved by the fact, that in no genus of the finny tribes do we find both these forms of organs, and that, in those which have the *cæca*, the pancreas-like organ is wanting; and conversely, those which are provided with the latter are destitute of the former organ. The triangular cellular organ of the Sturgeon, in short, may be regarded as the second form of this variety of structure.

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* A Systeme of Anatomy, treating of the Body of Man, Beasts, Birds, Fish, Insects, and Plants, illustrated with many schemes, consisting of a variety of elegant figures, drawn from the life, and engraved on seventy-four folio copper-plates; and after every part of man's body hath been anatomically described, its diseases, cases and cures, are concisely exhibited. By Samuel Collins, Doctor of Physic, Physician in ordinary to his late Majesty of blessed memory, and Fellow of the King's most famous College of Physicians in London, and formerly a Fellow of the Royal Foundation of Trinity College in the most flourishing University of Cambridge. In the Savoy, printed by Thomas Newcombe 1685. Two vols. folio.

In external appearance, indeed, it bears so close a resemblance to the pancreas of warm-blooded animals, that Dr Monro the second, who has left a delineation of it and its interior cavities, and Sir Everard Home, who represents it *in situ*, scruple not to give it the denomination; and their example has been more or less generally followed by writers on zootomy. I am averse to innovation, and unwilling to change names which imply no serious error. But I feel that it is requisite to point out the differences between this organ and the genuine pancreas in warm-blooded animals.

In the latter classes, the pancreas is a glandular organ of the kind named conglomerate, that is, consisting of lobules, which again are composed of granules named *acini*, which are liberally supplied with blood, and to which is assigned the duty of secreting from the blood a fluid not existing in it, and possessed of distinctive and peculiar properties. This organ, like other glands, is provided with an excretory duct or canal into which the secreted fluid is poured, and by which it is conveyed into the duodenum. The chyme, or alimentary pulp, does not enter this duct; but through it the pancreatic liquor is conveyed to the former. In the sturgeon, and similar fishes, on the contrary, the pancreatoid or cellular organ, though provided with thick fleshy parietes, presents no marks of glandular tissue; nor can any excretory duct be recognised. It contains a series of communicating cells, into which the chyme is conveyed, and from which it is afterwards returned by the same outlet into the intestine. If it secretes a fluid, as is maintained by some observers, it must be from the mucous reticular surface, in the same manner as when the gastric juice is secreted from the mucous surface of the stomach, and the intestinal fluid from that of the bowels. There is in truth no reason, unless its external appearance, to regard it as a glandular organ; and it seems chiefly designed for performing a more refined and exquisite part of the process of digestion. One purpose of it is pretty obvious, at least if we may reason from what would be the consequence of its absence. I allude to the fact, that the food which is conveyed into the pancreatoid cells, must necessarily be retarded in its transit through the alimentary canal; and if all the food which passes through the latter tube must perform the circular route of these cells previous to passing through the duodenum, it is manifest that it must be much more thoroughly digested than if no such organ existed to retard its conveyance. The use of such an apparatus for delaying the transit of the food, is so much more necessary in the finny tribes, in which the intestinal canal is straight and void of convolutions. To conjecture on this subject I am averse; but if this be admissible, in allowing me to advance a step farther in illustrating the use of this organ, I would be disposed, in the mean time, to regard it as intended particularly to retard the motion of the alimentary mass, in order more effectually to separate the chyle from the chyme previous to the conveyance of the former into the lacteals.

The lower, anal, or intestinal extremity of the duodenum, is situate in this specimen about 32 inches from its pyloric end; and after tapering a little, it opens into the straight or tubular intestine by a valvular orifice, very similar to that of the pylorus, and which projects into the cavity of the latter in the same manner, like the nozzle of a stop-cock.

This tube, which is the last part of the alimentary canal, may be described as a straight hollow cylinder, without curvature, of uniform diameter, and tapering toward the lower end, where it opens by an outlet or vent, distinct from that of the urinary organs, and finally terminating at the anus of the animal. In the specimen dissected by me, the length of this tube is twenty-four inches—not more than one-third of the length of the animal. Its diameter is about one inch; and, when divided, the breadth of its parietes varies from three and a half to four inches. Its parietes are half an inch thick, strong, fleshy, and cut firmly under the knife. In the recent state, their colour was intermediate between flesh-red and crimson-red, and perhaps a shade of auricula-purple; but at present they have assumed a blanched appearance, and approach in colour to cream-yellow.

The exterior covering is, as in the others, the peritoneum, which, at the posterior edge, is doubled off to form a mesentery by which the tube is attached firmly, and so as to prevent free motion, to the vertebral column. Subjacent to this, we find a thick layer of animal matter, which in density and firmness of texture, bore, in the recent state, a strong resemblance to the substance of the human uterus. At present it appears to be muscular, with a large proportion of firm, closely condensed cellular tissue. Within this is a structure and arrangement of parts so peculiar, that it cannot be described unless in successive steps.

In the first place, then, from the posterior or vertebral margin of the duodenal orifice, proceeds a long band of animal matter down the entire length of the tube, and situate as near as may be in its centre, so as to constitute a true axis to the intestinal cylinder. When the latter is cut open by a longitudinal incision through its whole extent, this longitudinal band, which may be justly named the *axis*, or *central column* of the intestine, appears to divide it into two halves; or, to speak more precisely, its plane divides the intestine into two semicylinders. The duodenal orifice is rather to the right of the upper extremity of this pillar; and it may be said to open in a sinus or hollow, situate between this and a membrane to be noticed presently. (Fig. 3.)

About one and a half or two inches from its upper extremity, there extends from the right margin of the fleshy *axis* to the wall of the intestine, a thin membrane, which then winds obliquely round the former, and proceeds in this manner, attached, on the one hand, to the axis, and in the other, to the inner surface of the intestine the whole way down. The arrangement is similar to that of a corkscrew, with a rod of wood inserted into the cylinder of the worm to represent the axis, or like a spiral staircase, winding round a central *modiolus*. The effect of this membranous slip winding round the axis is, that the tract of the intestine, instead of being only the length of the tube, is greatly increased. The combination of parts now described, constitutes what is termed the *spiral valve*,—an arrangement peculiar to fishes, and to the object and use of which we shall presently advert. Though long known, it has not been very distinctly described; and I have therefore been desirous to communicate as distinct an idea of its configuration, as mere verbal description is adequate to convey.

The inner surface of this intestine further presents certain peculiarities of structure, which, so far as I am aware, have not been recognised by anatomists. When inspected with care, the portions which are on the right side of the axis, are entirely different in structure from those on the left. In the latter, they are smooth and uniform, like a mucous membrane void of *villi*, and destined, like that of the respiratory organs in the MAMMALIA, to secrete merely thin serous mucus. On the right side of the axis, the portions of the bowel interposed between the spiral membranous slips present a distinct, though modified form, of the reticular structure exhibited by the duodenum. It is not uninteresting to mark the transition of these two forms of structure into each other The winding slips of the valve divide the tube, as it were, into a series of sinuosities or cells of an irregular elliptical shape.

The membranous lining of the first of these cells, on the right side, is, like the beginning of the intestine, smooth and uniform; but as it approaches the slip, it assumes the reticular or honeycomb arrangement. At the margin of the slip, again, and at the plane of the axis, this ceases, and it passes to the other side, in the shape of a smooth, polished, mucous surface. On the opposite side, and at the lower margin of this slip, however, the honeycomb texture again commences, and extends over the whole surface of the sinuosity between the two slips; but on the mesial plane the smooth polished aspect of the membrane is resumed. This alternate arrangement of reticular and smooth structure is observed the whole way down the tube. The number of the cells thus formed, is eight, with reticular structure, on the right side of the axis,—and nine, with smooth surfaces, on the left side. It is a remarkable proof of the carelessness with which this structure has been studied, that the only author who delineates it represents the membrane on both sides of the axis as reticular. This oversight I have attempted to rectify. (Fig. 3.)

The *axis* or central pillar of the valve seems to consist of bloodvessels, enclosed in cellular tissue, and enveloped in the same smooth uniform membrane which lines the sinuosities on its left side. The author to whom I last alluded, the late Dr Monro of this University, in his work on the Structure of Fishes, denominates the *axis* the *mesenteric veins;* and the membranous slips proceeding from it to the intestines, *branches of these veins.* This I cannot help regarding as a most fanciful and erroneous notion, which I can neither explain nor reconcile with the accuracy and zeal with which that able anatomist laboured to extend the bounds of our knowledge of the structure of the animal world. There is in the axis no appearance of venous trunks sufficiently large to constitute the mesenteric veins; nor do the slips contain any vessel entitled to the epithet of branches of these veins. It is very probable that the Doctor never examined their interior structure, and upon some loose analogy, or imaginary resemblance, took it for granted that the axis and its spiral membrane was a vascular distribution. I examined it by means of longitudinal and oblique incisions, but could find neither to my own satisfaction nor to that of the gentlemen present, any vascular arrangement more than that of small vessels, sent, as might be expected, to supply the axis. I regret that the circumstances under which our dissection took place, rendered it impossible to inject any part of the animal; but I shall avail myself of the earliest opportunity to supply this defect, and determine the point positively.

The use of the spiral valve is sufficiently obvious. The intestinal tube is not, as in the Mammalia and Birds, longer than the body of the animal, and convoluted into numerous turnings,—though the whole canal, reckoning from the mouth to the vent, is about the same length; the intestinal tube proper is considerably shorter, and does not exceed one-third of its length. By means of the spiral valve, however, it is divided into a series of cells, which wind round the axis between it and the cylinder, and which thereby lengthen the intestine at least to thrice its direct extent. The food is thus compelled to travel a route greatly more circuitous, than if it were passing through a simple straight tube; and if it is not enabled more certainly to undergo the changes necessary to thorough digestion, it is prevented from escaping through the bowel before the upper portions have undergone the requisite changes. This is the second instance in the finny tribes of a contrivance to compensate for the short course and the direct tract of the alimentary canal.

To complete this account of the alimentary organs of the Sturgeon, I shall add a few words on the liver and spleen. The former is one consisting of five distinct lobes, of glandular structure, provided with a duct, a gall-bladder, and common duct. Two of these lobes are connected by a membranous slip, above to the upper extremity of the œsophagus on the right side, and below to the stomach by ligamentous matter enclosing the hepatic vessels. Two more lobes are also connected to the stomach, and in the fissure between these is lodged the gall-bladder, the duct of which passes outwards, to enter the duodenum immediately below the pyloric orifice by the papillary process formerly noticed.

The spleen is peculiar in being attached, not only to the outer surface of the stomach, but to that of the duodenum, in its first or descending division. It is a long, narrow, pink-coloured organ, not unlike the tongue of an animal;

and is much firmer, and more consistent, than in the human subject.

The vessels of the alimentary canal are found at the posterior surface of the different bowels covered by peritoneum.

The urinary organs of the sturgeon consist of two long tubular canals, placed on each side of the intestine with the spiral valve, and resting on the spinal column and its muscles, to which they are attached by cellular membrane. To describe these organs is no easy matter; they resemble neither the kidneys, nor the ureters, nor the bladder of the mammalia or birds, but combine the characters of all these. Their parietes are thin and membranous. Their inner surface, which is red, smooth and mucous, but not distinctly villous, presents a series of minute orifices not larger than pin-heads, which correspond to the infundibula of the kidneys of mammiferous animals. The lower extremities of these canals widen, and, suddenly contracting, terminate in a common outlet or vent, which opens behind that of the intestine on the surface at the anal fin.

I may add also, that we saw the openings which maintain the communication with the peritoneal cavity and the surface of the body, and which in these animals are requisite for the purposes of reproduction. I am aware that these singular outlets, by which a direct communication is established between the surface and cavity of the peritoneum and the surface of the body of the animal, have been the subject of some controversy; and by some even their existence has been called in question. In this specimen, however, they were distinct; and as their existence is not confined to the sturgeon, they cannot be denied on the ground of anomaly, as I shall take occasion afterwards to show.

Since the foregoing paper was read to the Wernerian Society, I have had an opportunity of dissecting two other specimens of the Sturgeon, and of verifying some statements, and completing others which were deficient.

The first of these was a small male, measuring from the tip of the snout to that of the caudal fin 30 inches, caught in the Firth of Forth on the 5th of August; the second was a female measuring 3 feet 7 inches, reported to be caught off the mouth of the Esk, below Musselburgh.

Though, in the foregoing account, I described the stomach of the sturgeon exactly as I found it, I was not a little perplexed to find that my description of the direction of the organ, though derived from the parts exactly *in situ*, by no means corresponded with the delineation given by Sir Everard Home in the Philosophical Transactions, and subsequently republished in his Lectures on Comparative Anatomy. In these works the stomach of the sturgeon is represented as descending on the right side of the vertebral column, making a curvature or bend, and ascending on the left side to its first level, and once more forming a curvature, crossing the mesial plane, and descending a little to constitute the *pylorus*. In the first specimen, in which the stomach of the animal was completely crammed with alimentary matter, the first curvature was by no means distinct, or rather it was so indistinct as not to be recognised. In the two latter specimens, especially the third, in which the stomach was empty, and formed a long cylindrical tube, the curvatures were nearly the same as represented by Sir Everard Home. A little below the *cardia* it bulges into a fusiform swelling, represented at C, (Fig. 5.) then contracts and descends for 3 or 4 inches, makes a round bend, and crossing the mesial plane to the left side of the vertebral column, ascends, makes another round turn at P, and descends to form at *P* the *pylorus*. These varieties, in the figure and direction of the stomach, are to be ascribed, I conceive, to the opposite states of plenitude and emptiness. When the organ is empty, as in my last specimen, the curvatures are distinctly exhibited, in consequence of the strong contraction of the muscular fibres of the space between the cardiac and pyloric extremities. When it is recently and completely filled, on the contrary, the mechanical distension overcoming for the time the muscular force, not only distends the organ, so as to bring the lower and upper curvatures in close approximation, but causes the cardiac portion to revolve backwards on the pyloric, and thereby render indistinct, if not obliterate, the first curvature. But whatever opinion may be entertained as to the cause, no doubt can exist as to the fact that the stomach, when empty, is a long cylindrical tube, incurvated twice on itself in the transverse direction, and enclosing by its incurvations an elliptical space; and that, when filled, it assumes the appearance of a musculo-membranous sac, with an antero-posterior incurvation below, and a transverse one above, and inclosing, instead of an elliptical, an oblong triangular space.

The pancreatoid organ has been sufficiently described in the foregoing sketch. I have only to add, that the inner surface of this organ appears to secrete a thin fluid, which, instead of being conveyed, as in the *mammalia*, to the food, is insensibly distilled on the food introduced into its cellular compartments, and the chief use of which appears to be to render the alimentary mass more fit for the formation and separation of chyle. The fleshy substance of which it consists is liberally supplied with bloodvessels, the chief use of which is to secrete this fluid by vascular not follicular action. After the food has undergone this process, the muscular fibres contract, and propel the food from the cavities into the duodenum, in which the absorption of chyle appears chiefly to proceed.

With the view of ascertaining the structure of the axis or central pillar of the spiral valve, I injected, in the small specimen, a large vein; and, in the larger one, the arteries of the intestinal canal, at the mesenteric side of the intestine. The injection, which filled the small vessels of the bowel very well, shewed that the axis consists, not of mesenteric trunks, as might be inferred from the statement of Dr Monro *secundus*, but of minute capillaries distributed through cellular tissue. No large vessels can be recognised, although the mucous surface is reddened by the injection, and the axis appears to be simply very well supplied with minute vascular ramifications. It is further remarkable, that the membrane on the right side of the axis and the valvular slips are in general much better supplied with bloodvessels than the membrane on the left side of the axis. The result of this injection, I conceive, decides the question of the structure of the axis.

In the account of the large sturgeon above given, I have described minutely the reticular structure of the inner membrane, and have directed attention particularly to the fact of the alternation of this structure with smooth membrane on the right and left side of the axis. In the small specimen before me at this moment (August 7.), the reticular structure is not yet distinctly formed; and its commencement only can be recognised in the shape of minute specks, which are red-coloured from the injection, disseminated over the mucous membrane.

In the present specimens also, I had an opportunity of observing distinctly the different orifices at the anal fin, which in the sturgeon are peculiar, and of which, therefore, I have given a representation in the engraving.

The space which may be named the outlet, or common opening, is, in the small specimen, about the size of a sixpence, in the large one about the size of a shilling, elliptical, rather than round, with the large diameter longitudinally. This space presents in this animal four openings. The first, which is the largest, is anterior and superior, in the middle, and is the termination of the intestinal tube, or the lower opening of the spiral intestine. This constitutes the *anus* proper, and is represented at *a* (Fig. 5.) Behind, and a little below this, is another opening, much smaller, but large enough to admit a blowpipe or a small quill, and forming, by the elevation of its edges, a nipple-like projection (*n*). This, after passing about half an inch inward, divides into two canals, large and capacious, on each side of the spiral intestine, but behind the peritoneum, and consequently without that membrane. These canals extend upward, widening, and becoming capacious, and present at intervals blind cavities, the surface of which is vascular and villous. These cavities, which resemble closely in structure and appearance the small follicular sacs of the mucous membranes in the MAMMALIA, are analogous to the *infundibula* of the kidneys in this class; and the whole canals may be regarded as kidneys, arranged in the longitudinal form, and terminating in a common urethra, immediately behind the anal orifice, as already stated. The small nipple-like orifice, therefore, may be regarded as a *urethra,* or at least a common *ureter;* and there is, consequently, in the sturgeon no cloaca or common outlet for the intestinal tube and urinary organs as in other fishes.

The lateral openings on each side of the *anus* are still more curious and important, and merit the particular attention of the zootomist. These openings were recognised by Monro, and are mentioned by others; but many have doubted their existence; and from none have they received the attention to which their peculiar relations entitle them.

It is remarked by Cuvier, that though the distribution of the peritoneum in fishes is analogous to that of the same membrane of the *Mammalia*, it presents in the family of the *Raiæ* a peculiar circumstance of organization. Instead of being a sac, shut on all sides, as in the mammalia and the reptiles, it is perforated in two places, and communicates with the lateral surface of the body by two orifices, one on each side of the anus, leading directly into the cavity of the abdomen.

This arrangement is not peculiar to the Ray *genus*. I have seen it in the dog-fish; it is represented by Sir Everard Home in the shark and lamprey; and it was seen by Dr Grant in the sword-fish. In the sturgeon it is found in remarkable perfection. In the specimen before me these orifices are sufficiently large to admit a good-sized quill, and lead directly into the cavity of the peritoneum (*o o*, Fig. 6.). Their outer part is formed by a ring of mucous membrane; their inner is peritoneum; and it is interesting to remark the transition between the mucous and serous surfaces, which is here distinctly visible. My chief reason for directing attention to them at present, is to show that, singular as this structure appears, and at variance as it may seem with our ideas of the anatomical configuration of the shut sacs, it presents no anomaly which may not be reconciled with the general characters of these membranes, and no deviation from the rank which they hold in the system of organized membranes.

I have remarked, in my Elements of General Anatomy (p. 740.), that the peritoneum in the female presents an exception to the character of continuity and non-communication of the outer with the inner surface of serous membranes, in being perforated in two points, corresponding to the upper orifice of the Fallopian tubes. I have, at the same time, observed that this is the only spot "at which the mucous and serous surfaces communicate directly with each other." This statement is applicable to the whole class of mammiferous animals in which the peritoneum is perforated in the same manner, and where, consequently, the same communication is established between the serous and mucous surfaces, and, consequently, between the serous surface of the peritoneum and the external or cutaneous surface of the body.

Exactly in this predicament are the orifices of the ray, shark, and sturgeon now mentioned. Though at first sight extraordinary that there should be a direct communication between the external surface of the body and the cavity of the peritoneum, on reflection it appears not more extraordinary than the communication between the cutaneous and mucous surfaces with the serous in the *Mammalia* generally. In the males, indeed, of this class, we have not yet demonstrated this communication. But, if our researches are directed to the period of fœtal life, I think it not unreasonable to anticipate such a discovery.

In the Sturgeon, I have already stated my belief that the existence of these orifices is connected with the mode in which the animals propagate their species. The chief reason for this opinion is, that in this animal no opening from the ovaries exists into the cloaca, as in others of the finny tribes. So far as can be judged in an animal so young, I regard the smallest specimen as a male, the soft roe or milt being seen on each side of the vertebral column, and urinary bladder. The large one is evidently female. In neither, however, do I find any communication between these parts and the cloaca; and I am therefore inclined to retain the opinion originally stated, that the peritoneal orifices are the outlets for the spawn and ova of the animals. This opinion, I admit, requires confirmation before it be recognised as an established principle. In the mean time, it may serve to direct the attention of those who have more frequent opportunities of observing the habits of fishes than my other engagements allow me.

Most of the objects represented in the engraving, Plate IV., have been explained already in the course of the foregoing account. Fig. 1. represents the *œsophagus* and stomach, the former with its *papillæ*, the latter with its curvatures; and a more complete view of the direction of these curvatures is given in Fig. 5. Fig. 2. exhibits the pancreatoid organ, the *pylorus*, and the *duodenum*, with the reticular structure of its inner membrane. Fig. 3. shews the intestine with the spiral valve; A A, the axis or central column; *r r r*, the reticular cells on its right side; and *l l l*, the smooth ones on its left. Fig. 4. is the posterior margin of the orifice into the swimming bladder. And in Fig. 6. are seen the four openings, the *anus* (*a*) and *urethra* (*n*), on the mesial plane, and the lateral peritoneal orifices (*o o*) on each side.

PLATE IV.

Fig. 1

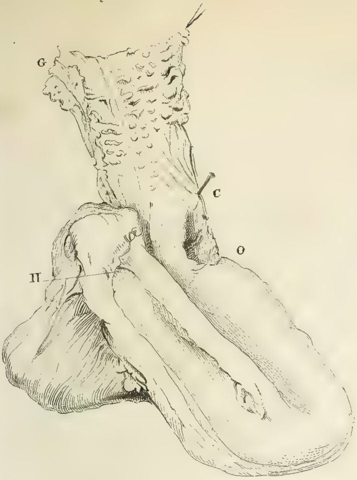


Fig. 6.

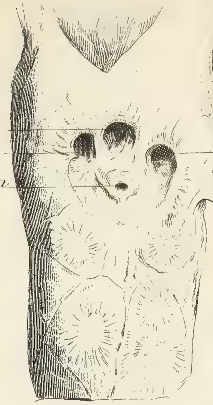


Fig. 3.

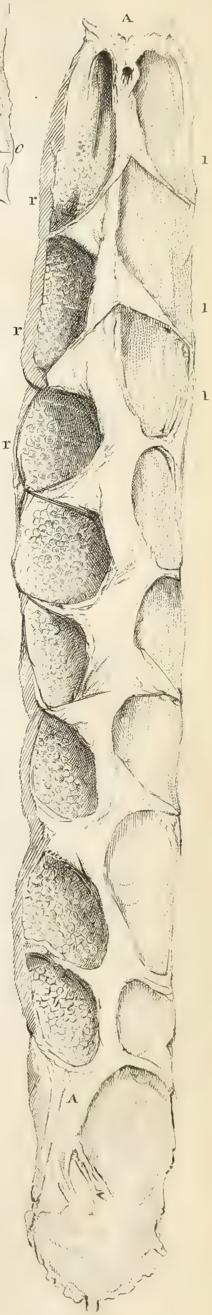


Fig. 4.

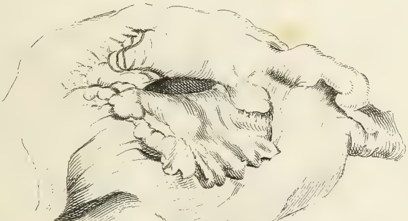


Fig. 2.

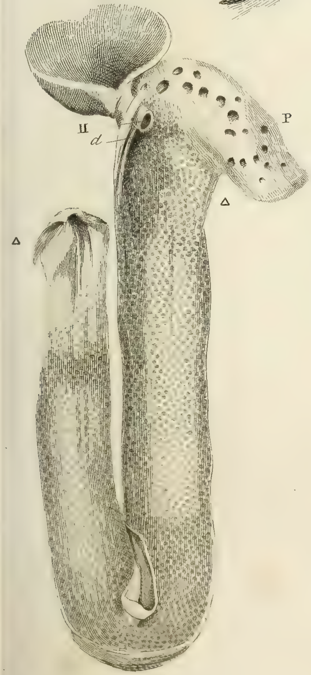
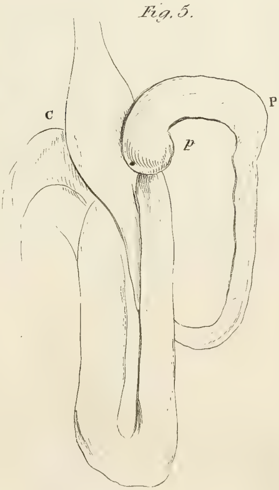


Fig. 5.



XIII. — *Observations on the* Aranea geometrica, obtextrix, domestica, *and other Spiders; and particularly on the power they possess of fixing their threads horizontally, or at any degree of inclination, to two perpendicular bodies at a considerable distance from each other, so as to suspend the circular part of their web in an open space: Also some remarks on the Food of Spiders, &c.*

By Mark Watt, Esq. M. W. S.

(Read 6th February 1830.*)*

It was in consequence of observing it stated in the first edition of Kirby and Spence's Introduction to Entomology, that it was not known how the garden or geometric spider attached the long lines which supported its web to two upright bodies at various distances from each other, and at a considerable elevation above the surface of the ground, that I made a number of experiments to ascertain how this was accomplished, and the result of these experiments was published in a short paper, in April 1817, in Dr Thomson's Annals of Philosophy

The observations I have since made confirm what I then expressed, viz. that it is quite indubitable that the geometric spider has the power, either in a room or in the open air, when the atmosphere is calm, of throwing out its thread with great rapidity to the length of several feet or yards, and in such a manner as to strike against a particular part of any body that may be within the reach of the thread. I have very often observed the geometric spiders in the act of performing this curious operation; and I can affirm, that the larger individuals seem to be able to hit any spot they intend to attach the end of their thread to, with almost the same precision that the jaculator fish strikes a fly with the drop of water it ejects from its mouth. Indeed, the regular disposition of the threads that radiate from the centre of the web of these spiders, is a proof that they must be capable of directing their lines to a given point, as these threads are often five and six feet long.

The method I at first adopted to discover this very interesting faculty of the spider, was to place a pretty large stone in the centre of a broad plate, and fill the plate with water, leaving the upper part of the stone dry: then by means of a little clay or putty I placed a slip of wood or a straw, a foot or two high, perpendicularly on the stone; some spiders were then placed on the dry part of the stone. By this method I perceived the spiders, which have an aversion to the water (as they cannot move upon it), make their escape from the confinement, by the upper end of the piece of wood, or the straw.

After examining the circumstances of their situation, they uniformly had recourse to one of two methods by which they made their escape. They either let themselves drop down by their lines about two inches from the top of the stick, and, turning their spinners towards the wall of the apartment, they threw out their threads with great rapidity till they touched the wall, where they stuck, and the instant they struck the wall, they turned round and fastened the other ends of the threads to the stick, and thus ran across;—or they ejected a line upwards, which its buoyancy, if the spider was small, carried up to the roof of the room, or to a high part of the wall. They often did this when made to drop, by a slight shake from the point of the finger; and I have observed this happen so late in the evening, and in such very cloudy weather, either in the still air of an apartment, or in the open air when serene, that I do not consider that the ascent was caused by the rarefaction of the lower atmosphere.

I have noticed four different species of spiders that have the faculty of emitting their threads in this curious manner. 1. The garden spider from the time it emerges from the nidus;—2. A spider of a light brown colour which I have not yet seen described: It is not shaped like the young of the house-spider, nor does it attain to a third of its size, but it is larger than the gossamer spider: It weaves a very thin web;—3. The gossamer spider; and 4., a small green-bodied, flat spider, which has not yet, I believe, been properly described. It is somewhat of the form of the sheep tick, with short dark brown legs, and is usually found amongst stones and old walls; it is very fierce, beating off spiders of three times it own size. It is not to be confounded with a green-striped spider, for they are quite distinct; the latter being sluggish and weak, with long white legs. I should also be inclined to think that the Aranea diadema had this power *.

There appears still to exist a considerable difference of opinion amongst entomologists, in respect to the power the spider has of directing the thread it ejects to any particular spot to which it is desirous of attaching it; and also as to its capacity of ascending into the air, by the buoyancy of the long line it emits.

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* Mr White, in his Natural History of Selborne, and Mr Murray of London, in his Experimental Researches, has made several interesting observations on the power the gossamer spider possesses of raising itself into the air.

Mr Blackwall of the Linnean Society, London, in a memoir read before that Society last year, concludes that the gossamer spider has no power of elevating itself in this manner, except in the morning; and that its ascent at that time is caused by the rarefaction of the air on the surface of the earth; that the gossamers are then carried to great heights by the rarefied air as it ascends; and that the gossamers descend in the evening as the upper atmosphere becomes cooled.

I have no doubt Mr Blackwall's observations are generally correct as far as relates to the gossamer spider, and as far as regards the season of the year when they are seen flying most plentifully, which is in the end of October, and beginning of November. But at that season both the spiders and the most part of animated nature, have lost much of their liveliness and power. The gossamer spiders have then ceased to hunt for their usual food; and it is highly probable that an incipient feeling of torpidity may impel them, as it does many of the feathered tribe, to seek by flight for that change of situation, which they actually obtain; for the western breezes which then often occur must carry them to a great distance. The smallness of the animal is no objection to this idea, as several of the insect classes, particularly amongst the ant, bee, and spider genera, display in the circumscribed sphere allotted to them, as great a variety of instinctive faculties, as any amongst the feathered tribes.

In the month of June and beginning of August, I have often observed individuals of the gossamer species take their flight from the end of my finger, and ascend, at various times of the day, even in the afternoon, with a rapidity much greater than I should suppose to arise from the motion of the rarefied air: and this has taken place either in the still air of an apartment, or in the open air when calm.

The diversity of opinions that still remains upon these points, seems to me to arise partly from some naturalists having directed their attention to one species of spider, whilst others, in endeavouring to ascertain the same facts, may have made observations on a different species; and also from their having drawn their conclusions from facts, which, though applicable to the same species, yet do not apply to it at every period of its existence;—one having investigated the habits of the spider when young, and another at a more advanced season of the year, when the insect is fully grown, and when both its habits and capacities are considerably changed.

I have, for example, often observed the garden-spider when young, ascend by emitting a long line at a right angle to that by which it was suspended from any body: but as this spider frequently attains to a great size, it cannot, when it becomes heavier, rise by any such means. The larger the size of this spider, however, (Aranea horticola), the greater is the distance to which it is capable of shooting out its thread in a straight line.

When under the influence of a warmer climate, this spider grows to a much greater size than in Britain. In France and Belgium I have often met with them about an inch long, and three-fourths of an inch broad across the abdomen. In the end of September (1817) I had a very favourable opportunity of observing a number of these spiders in the Botanical Gardens of Ghent and Brussels. It was just before winter operations had commenced; and in the garden at Ghent there were a great many tall plants of the Arbor Vitæ, Cedar of Lebanon, and Cypress; and the spaces between them were thickly occupied by the webs of very large geometric spiders. These spaces were sometimes about ten and twelve feet across; and the circular parts of the webs were apparently about a foot and a-half or two feet in diameter, and many of the spiders could not be less than half an inch broad across the abdomen.

The long lines, which supported the centres of the webs, were fixed to the branches of the trees which were opposite to each other, and these lines radiated regularly from the centre of the open spaces, at acute angles to one another. Now, I apprehend that it is impossible to conceive how the spiders disposed the long threads that sustained the central parts of the webs with any degree of regularity, without admitting that they must have the power of directing the lines they eject to a given spot.

The manner of forming the ground-work or woof of their nets which I have observed, is this: After having made choice of a place (say between two trees), and in a calm evening, they dart a long thread from their spinners right across, from the tree they rest on, till it strikes the opposite tree. They then turn round and fix the other end of the line and run across, strengthening the first thread by drawing out a second line after them. Making this line sufficiently strong by going twice or thrice over it, they take their stand in the centre of it; and *from this point*, they emit the other threads at acute angles to each other, in a similar way to the first; fixing each of them near the centre of the first line, by pressing their spinners against it, and running up and down each, as it is formed, they tighten and strengthen it.

The method of weaving the circular part of the web or warp has been often accurately described.

It is well known that, if the web of the garden-spider is broken by any contingency, it does not attempt to mend it except the air be still, and that it generally chooses the twilight for this operation. If the spider does not mend its web in a calm evening, the country people consider it a

PLATE V.

Wern. Mem. Vol. VI. p. 370.

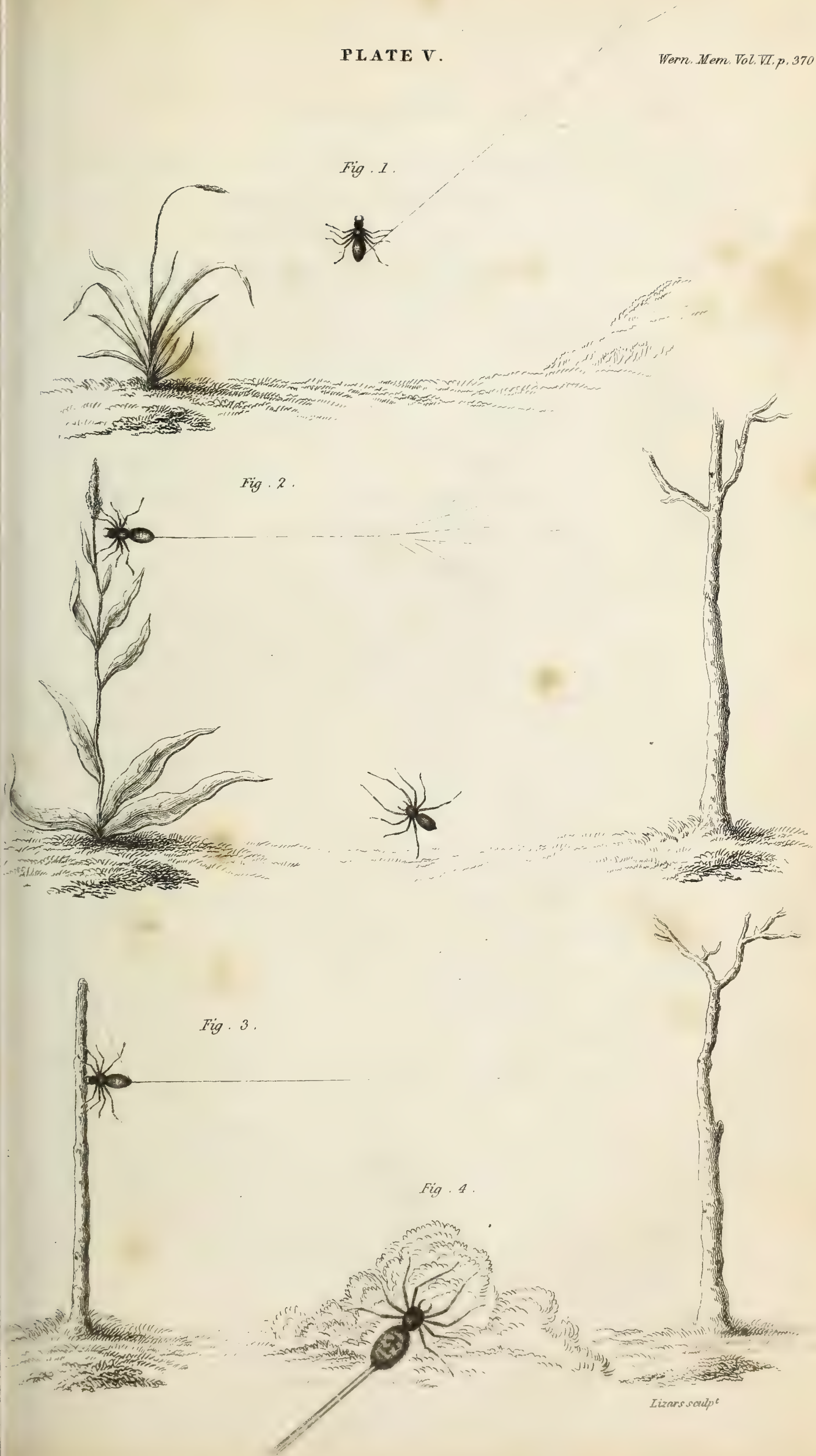
Fig. 1.
Fig. 2.
Fig. 3.
Fig. 4.

Lizars sculp^t

MUSEUM

sign of coming rain; that is, the spider feels the electrical changes of the atmosphere, which indisposed it for working.

The most curious and intricate part of this subject has never been as yet discussed by naturalists. It is the consideration of the process by which it is possible for a spider to dart out a thread so long, and in *a straight line.* It is easy to comprehend how threads can be drawn out to a state of extreme exility, considering the glutinous substance of which they are composed; but I consider it impossible for a spider to emit a thread of five or six feet long in a perfectly straight line, and with such rapidity that it is accomplished in a few seconds; without admitting that it has the power of ejecting also at the same time, either some gaseous matter, or some fluid resembling the electric; and this, from what I have remarked, I am inclined to think is the fact. No mechanical force arising from the contraction of the muscles of the abdomen of the insect, could produce this phenomenon, without the assistance of some such fluid. For if a line of such tenuity were lighter than the atmospheric air, the end first thrown out would rise and cease to go forward; if heavier than the air, it would fall; if of the same weight with the air, still the part first ejected would be opposed by the density of the atmosphere, which would be quite sufficient to stop the progress of a body so light.

I have sometimes observed spiders minutely, when the sun was shining clear, in the act of throwing out their lines, emit fourteen or fifteen filaments at once, and whilst these were flying so as to diverge considerably from each other, they evidently sent a stream of some fluid along the filaments, which both coalesced them into one line, and rendered that line straight. I have also remarked, that occasionally the geometric spider has thrown out half the length of the line it intended to strike upon some object, and after resting a little, by another effort has lengthened it and sent it quite across. Now when the first part of the line has actually ceased to move, it could not again set it in motion by ejecting a continuation of the thread behind it, without the assistance of some gas or fluid. Indeed, as the thread of the spider seems, when first emitted, rather lighter than the air, it is impossible that any impulse, without the assistance of some such cause as I have alluded to, could give it such a rapid motion forward *.

All authors, therefore, who treat of this subject, as far as I have noticed, ascribe the extension of the thread to the action of the wind, and the hind legs of the spider, and they do not suppose that the insect has the power of ejecting its thread when the air is perfectly tranquil. However, it is evident from what has been remarked, and also from a glance at the webs of the largest geometric spiders, that this supposition is incorrect, as the long lines of these webs radiate regularly from the centre in all directions; and I never could observe that they used their hind legs in drawing out their threads; they only use one of their hind legs in guiding and measuring the distances of the threads when forming the circular lines or warp of the web. The surprising rapidity, indeed, with which they shoot out their threads precludes this idea. One clear evening a friend of mine and I both observed a large geometric spider on the post that supported the gate of a park: it turned its back to the opposite post, and in a few seconds shot out a line that struck against it. The instant it struck the opposite post, it turned round, pressed its spinners against the post it stood upon, and thus fastened the thread; and then ran across it. Many species of spiders that draw out their threads, seem to have no power to shoot out their lines in this manner.

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* The powers of the Bombardier, the Ink fish, and the Torpedo, are analogous to this property of the spider.

Food of Spiders.—It has been generally believed that the only food of spiders in this country is composed of small flies and other insects. But from what I have observed I have reason to conclude that some of the species feed also on other substances. I am aware that the idea would not perhaps be readily received, that the house-spider (Aranea domestica) does not live principally on flies, or insects. But the truth is, it weaves its web very commonly in places where flies seldom are seen; and this fact alone would be quite unlike the perfect wisdom which every animal exhibits in all matters connected with the sphere of its existence. Great numbers of the webs of these spiders are to be seen in the corners of dark damp cellars, and between the upper part of the couples of old barns and stables. A vast many webs may be also observed in country houses where the furniture has not been moved for some time, behind book-cases, in dark closets, or some such places where flies seldom approach. Their webs, too, are ill formed for catching insects; the plane of the web lies horizontally, whilst those spiders that exist chiefly on flies, place the surfaces of their webs perpendicularly. They are also too thickly woven, so that when they have received a little dust, with which they must be covered in a few hours, a fly finds little difficulty in alighting upon them and flying off again. I have no doubt that their webs are intentionally situated so as to catch and retain the finer particles of what is generally termed dust; but which in the places where the domestic spider weaves her web, is a mixture of the particles of decomposed wood, lime, vegetable substances used as thatch, and the productions of the minute fungi called mould. This will not appear in the least degree contrary to what is known of the economy of nature, when we recollect that the larvæ of the house-moth (Phalæna tinea) live often entirely on old fur or feathers, and that the timber capricorn (Cerambix violaceus) and the Borer tribe (Ptinus) subsist on old wood.

I enclosed a young spider of the domestica species, some years ago, in a small box with a glass top, and air-holes; I put nothing beside it but a very little brown sugar and magnesia. I observed that it consumed a considerable quantity of the sugar. I kept it three months on this fare; and it both grew in size and activity. As the heat was great that season for about a month, in the south of England, where I then resided (Fahrenheit's thermometer often standing at 90° in the shade of an apartment), the spider I remarked, drank up with great avidity a small drop of water when presented on the end of a quill. This it frequently did when the temperature was high. The spider had lost one of its legs when I got it; but the first time it cast its skin (which spiders do often whilst growing), a young leg appeared lying along the thorax. It was short and white at first, but soon became dark and as long as the other. I have no doubt that the web of the spider supplies it with drink from the dew it collects.

I have remarked also that the garden-spider has taken small pieces of raisins when thrown upon its web, and sucked the saccharine juice. If a piece of paper or other substance was thrown on the webs, the spiders did not touch it, or threw it over the web; whilst they took the small bits of raisin into their lurking places.

About the end of last Autumn (1828), a house-spider made its nest on the roof of my dining room, and as I did not allow it to be touched, it remained there for six weeks. The animal completed its nest in the form of a ball, and attached it on every side to the roof. During that time no insect ever approached it that I could observe. But the whiting or size of the roof was peeled off to the extent of two inches around the nest, and I have every reason to believe that the spider subsisted on this matter, as the white size was removed by degrees, and in some spots, a good way off from the place where the nest was fixed. I am aware that spiders can exist for a long time without food, even for two or three months, but then this power of abstinence depends on the temperature of the air. In summer they cannot subsist so very long without food, and in winter they remain dormant, at least some of the species do so. If they want food long, they always decrease in size, whilst the spider above mentioned rather increased in size, and span a thick nest of about half an inch diameter.

In the Annals of Philosophy there is a description of a spider's having consumed a dram of the sulphate of zinc in a month, which if I recollect, was represented, in a paper which followed, as changed by the process of digestion into the carbonate.

The house-spider draws out a very broad thread composed of innumerable filaments, but has no power whatever of shooting out its thread like the geometric spider. I have noticed these spiders when confined in a glass case, and the breadth of the thread of the larger spiders could not be less than a third of an inch.

I put a number of them together, and they seemed to have no disposition to fight like the Horticolæ. They appeared to me to suck the moisture out of bread softened with water, when put beside them ; and in the place where I found them, which was a dark wine cellar below the level of the ground, I am sure a fly would not enter once in a month. I do not mean to say they do not kill and eat flies when they happen to get them, but I believe flies are not their chief subsistence. Their lurking place made in the central corner or apex of the web, appears indeed, as if formed for watching the approach of prey, but it is also constructed no less obviously that they may escape being surprised by an enemy, as they can run off either by the upper or lower part of the web; and birds, large beetles, the smaller quadrupeds, and their own species are all their enemies. I have often met with some of the Aranea domestica in the Isle of Wight, that measured from the extremity of the longest leg to the extremity of the opposite one, when stretched out, six and a-half inches: whilst the body was comparatively long and thin. As these spiders cannot throw out their threads, they always commence their webs in the corner of an apartment, or where they can find some angle where they can fix their first and shortest threads; and the collection of threads they draw out appears often the breadth of a third of the diameter of the animal's body.

Description of Plate V.

1. The gossamer, or young geometric spider, beginning to ascend into the atmosphere, by the buoyancy of the threads it has emitted.
2. The spider, coalescing by means of some subtile fluid, about a dozen filaments, into one thread, so as to bring all the filaments into a straight line, and with it to strike the opposite object.
3. The manner in which the geometric spider shoots out its thread when about to form its web; so as to fix its first line betwixt two perpendicular bodies, at any distance, and at any elevation.
4. The form of the combination of threads which the domestic spider *draws out* when forming its web.

XIV.—*Description of a Silurus, known in Demerara by the name of* GILBACKE, *more properly* GEELBUIK.

By Dr T. S. TRAILL of Liverpool.

(Read 18th December 1824.)

A SPECIMEN of this silurus was lately examined, and its figure, while recent, drawn by my friend Charles S. Parker, Esq. who has since favoured me with the drawing, and the skin of the fish.

It would appear to be a common species in the muddy waters of the rivers of Guyana, where they mingle with the sea; and it is found at a considerable distance from the coast. When taken, it is used as an article of food.

		Feet.	In.
This specimen, when recent, measured	-	3	4
Its circumference at the first dorsal fin,	-	1	11
at the ventral fin, -	-	0	10½

And it weighed 27 pounds.

The true Dutch name is undoubtedly *Geelbuik*, or Yellow belly. The upper parts are of a fine olivaceous green; the sides and belly of a rich yellow. The body is thickest at the first dorsal fin; and its section there would be nearly circular. It tapers quickly, yet equally, towards the tail, where it is slender. The head is broad, flat, and compressed. The vertex is defended by a rough bony plate of considerable firmness, which sends off two posterior appendages toward the upper part of the branchial apertures. The middle of its posterior margin is notched, to receive the apex of a very strong heart-shaped bone, the lobes of which reach the base of the dorsal fin. This shield or plate is rough with bony granulations, of a larger size than those of the armour on the head, and is obtusely carinated towards its posterior part.

The head is very broad; the mouth is wide, terminal, and furnished with numerous minute teeth, which are rather intended for holding fast, than biting the prey of the animal. These teeth are thickly planted on the edges of the mouth, in such a manner as to resemble the hairs of a very stiff brush. They are arranged in two groups about half an inch wide, on each jaw, reaching along the whole aperture of the mouth, and are divided in front by a slight furrow. Two convex, oblong bones of considerable size, and furnished with similar teeth, form the osseous palate of this fish. The eyes are small, placed rather above the line of the mouth, and more than an inch and a half from its angles. There are six tentacula or cirri on the lips. The longest pair are on the upper jaw, very near the angles of the mouth, and measure full 8 inches in length. The next pair are more than an inch below the lower jaw-bone, and measure 4½ inches. The shorter pair are placed near the middle of the lower jaw, and measure 2½ inches.

The first ray of pectoral and first dorsal fins consists of a very strong and slightly incurvated bony spine, with a rough granular surface, and a serrated concave edge. The sharp apices of these spines form powerful weapons of offence and defence for the naked body of the fish. The pectoral spine is a little more curved than that of the dorsal fin. All these spines are moveable, apparently by means of strong muscles. The length of the dorsal spine is 6½ inches; that of the pectoral spines nearly 6 inches. Besides its bony spine, there are seven rays in the first dorsal fin; but there are no rays in the second, which is adipose, but not very thick. The number of rays in each pectoral fin, exclusive of the spine, is eleven. The two ventral fins are 3 inches apart, and each of them seems to have six rays. The ventral and anal fins have a deep red colour in the recent fish. The latter has 18 rays. The tail is deeply forked, and has 30 rays. The lateral line is slightly waved. The air-bladder lies below the heart-shaped bony shield, and is attached to the first vertebra. Its form is best expressed by the accompanying figure (Plate VI. Fig. 1. *a.*).

It is to be regretted that the descriptions of scientific travellers and of naturalists are often too concise to enable us to discriminate with certainty the animals they meet with. The Silurus now under consideration has some affinity to the *S. Felis*, *S. Catus*, *S. galeatus*, and *S. Herzbergii*, as noticed in Shaw's Zoology, and other works; but its bony casque, and the armature of its fins, seem to discriminate it sufficiently from the two first. Its size, forked tail, its heart-shaped *nuchal* plate, and the number of rays in its anal fin, distinguish it from the third species; while its colour, casque, and the position of the adipose fin, prevent us from confounding it with the last, unless I am deceived by the imperfection of the descriptions of our systematic writers.

Conceiving it to constitute a new species, I would propose to name it in honour of its discoverer, who, in a short visit to Guyana, undertaken for other objects, has zealously applied himself to illustrate the natural history of that country. It may have the following specific character:

SILURUS PARKERI. PARKER'S SILURE.

Plate VI. Fig. 1.

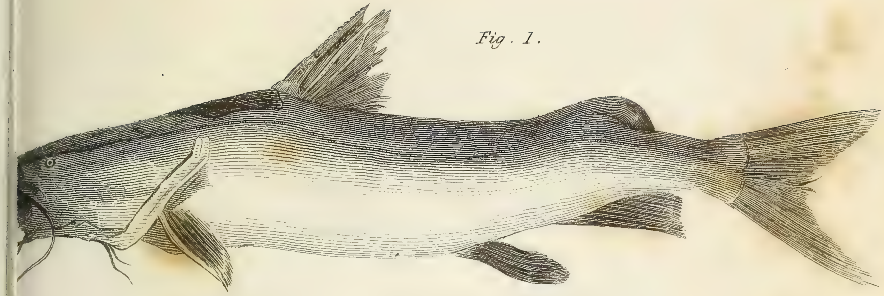
SILURUS olivaceus, subtus flavus; capite cataphracto, cirris sex; radio primo pinnarum pectoralium et primæ dorsalis, validissimo, serrato; pinnis imis rubris; ani radiis 18, cauda furcata.

SILURE olivaceous above, beneath yellow; with the head galeated; the first ray of the pectoral, and first dorsal fins, very strong and serrated; the fins on the belly red, and 18 rays in the anal; the tail forked.

PLATE VI.

Wern. Mem. Vol. VI. p. 380

Fig. 1.



a

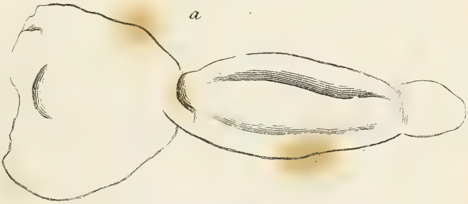


Fig. 2.

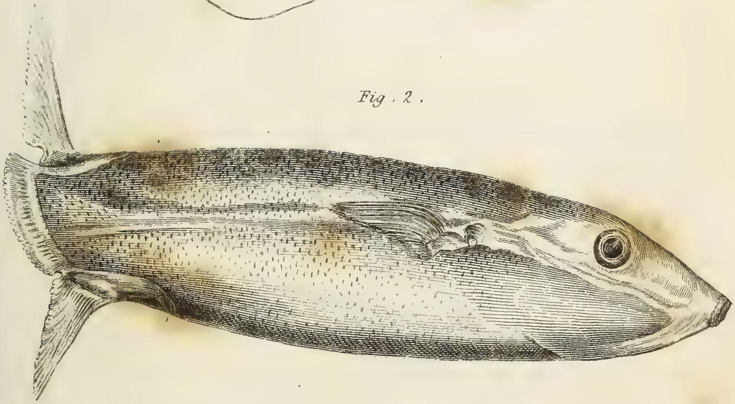
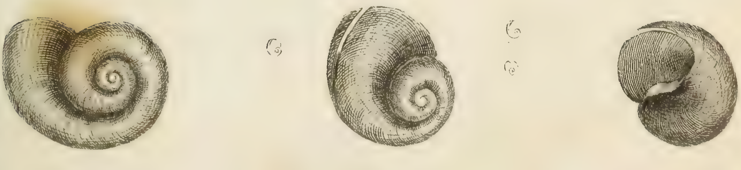


Fig. 3.



Lizars sculpt

[illegible]

XV.—*Description of a New Species of Cephalus, which it is proposed to name* Cephalus Cocherani, Cochrane's Sunfish.

By Dr T. S. Traill of Liverpool.

(Read 16th April 1825.)

Char. Specif. *Cephalus corpore elongato, truncato subargenteo, spinis vel tuberculis carenti.*

Sunfish with elongated but truncated, sub-argenteous body, destitute of spines or tubercles.

This small species is sufficiently characterized by its form, as a sunfish; and appears to differ from any described by systematic ichthyologists, so much as to entitle it to be reckoned a new species. It was found in the stomach of a *Bonito* or *Albacore* *, which was caught on the 17th of May 1822, in Lat. 18° S. Long. 81° W., by a sailor on board of the O'Higgins, Lord Cochrane's flag-ship. On this account I have proposed the name in honour of that gallant officer. A correct drawing, the exact size of the original, was made by a young Chileno then on board; and this having been presented to me by a gentleman, then acting as his Lordship's secretary, it accompanies the description of the fish. See Plate VI. Fig. 2.

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* Either *Scomber Pelamis* or *Scomber Thynnus.*

The drawing measures, from the snout to the extremity of the caudal fin, 11¼ inches. It is three inches in depth: the dorsal fin measures 2½ inches in length; the anal not quite 2 inches; the pectoral 2 inches; and the caudal fin $\frac{3}{10}$ths of an inch.

The general form of this species is more *fish-like* than that of any other of the genus. The separation of the dorsal, caudal, and anal fins is distinctly marked in the drawing, which seems to have been executed with much care. The habit of the body is said to be less compressed than the sunfish described by Pallas, so that " a section of it presented a full oval, except towards the tail, where it was considerably thinner." The skin of the body is described to me as having been covered with a sort of indistinct appearance of small scales, in size like those of a sole; they were not imbricated, but adhered all round to the skin. The head, however, was quite smooth. The general colour of the fish was a dull silvery or plumbeous hue, which became nearly white, or of a cream colour on the belly. The eye was large and prominent *; the mouth a small circular hole with horny edges, but without any moveable lips. The top of the head was slightly flattened. A cartilaginous substance extended from the pectoral fin, so as to include the upper and fore part of the head, and returned by an acute angle ¾ inch from the snout toward the breast. The extent and form of this substance, which was, however, covered by the general integument, is well marked in the drawing.

My informant had not observed the branchial apertures, from which we may conclude that they were small.

The general form of the pectoral, dorsal, and anal fins in the drawing is triangular and pointed. They as well as

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* In the drawing it measures 0.6 inch in diameter.

the caudal are stated to have been placed on whitish cartilaginous substances, as there expressed, which were moveable by appropriate muscles. The upper part of the caudal fin projects beyond the lower; and its general form approaches to the small segment of a circle, 4 or 5 inches in radius.

XVI.—*Remarks on the Genus* Scissurella *of M. D'Orbigny, with a description of a recent British Species.*

By John Fleming, D. D. F. R. S. E. &c.

(Read 19th May 1827.)

In the year 1809, I found, among a quantity of sand thrown up by the tide, on the Isle of Noss, Zetland, many of the rarer microscopical shells of the "Testacea Britannica." Among these, one appeared, remarkable for its Argonauta-like aspect. Upon sending specimens to my valued correspondent, the late George Montagu, Esq., I was not a little surprised to find, that he regarded it as nothing more than the fry of a Trochus! The shell being of a small size, I entertained some suspicion that it might be young, and not perfectly formed, and trusted to a future opportunity of obtaining larger specimens. In this, however, I was disappointed, as I never was able to detect the species at any subsequent period.

Three years ago, upon communicating specimens to that intelligent naturalist, Mr Dillwyn, he informed me that a genus for the reception of analogous species had been recently instituted in France, under the title Scissurella. An abstract of the paper, announcing the genus, by M. Alcide Dessalines D'Orbigny, in Memoires de la Societé d'Histoire Naturelle de Paris, i. 340, is given by Mr G. B. Sowerby in the Zoological Journal, i. 255.

M. D'Orbigny's character of the genus, as translated by Mr Sowerby, stands thus: " Shell univalve, free, umbilicated, with a depressed spire, aperture rather rounded, without a canal, its lips without a peristome and disjoined: right lip notched with a deep slit, following the growth of the volutions, obliterated to within a short distance of the margin, and forming a sort of keel upon the back of the shell." According to M. D'Orbigny, the shell belongs to the family of Trochidæ, while Mr Sowerby is inclined to consider it as related to the Fissurelladæ. The last observer supposes that the slit in maturity is obliterated at the margin, leaving the peristome entire; but that immediately behind the margin, there is a perforation left by a portion of the slit not being filled up, as in the genus Haliotis. Though this last circumstance may take place in some species, I may observe, that in the one in my possession, that part of the body whorl on each side the slit is apt to break off, and thus efface the most obvious mark of the genus.

Scissurella crispata.—Shell white, and without any apparent cuticle. The largest specimen in my possession does not equal the fifteenth of an inch. Whorls three, increasing rather rapidly from the slightly elevated apex, and sloping with a gentle convexity from the separating line to the keel. Under side with a central cavity, from which the whorl extends, a little convex, to the keel. The whorls are marked by numerous fine transverse arcuated ribs, narrower than the intervening spaces, crossed by fine longitudinal striæ (most conspicuous in the spaces), giving to the shell its peculiar reticulated appearance. The ribs on the upper side are coarser than those below. The aperture is suborbicular, slightly depressed; the outer lip thin, the inner lip slightly reflected over the cavity, spread on the body whorl, and continuous with the outer lip. From the pillar cavity a shallow gutter extends anteally, and shortly joins the pillar lip. It is chiefly conspicuous on the larger specimens. The longitudinal slit, in the middle of the outer lip, extends backwards about two-thirds of the diameter of the shell, when it joins the narrow groove in the keel of the shell which had formerly been occupied by the slit. The margins of the slit are slightly elevated, as well as the groove, which is seen winding round at the separating line nearly to the apex. The groove itself is slightly ribbed across.

It seems probable, that the slit is situate immediately over the aërating organs of the animal. All the specimens, when found, were destitute of the animal, thus preventing any observations on its forms; but, from the number of shells collected in one spot, it would appear to be gregarious in its habits.

The preceding description offers one statement which would seem to forbid the insertion of this shell in the genus S issurella of M. D'Orbigny,—*the continuous peristome.* In the generic character, the lips are represented as *disjoined.* Whether this may lead to the institution of a new genus, when a greater number of recent species shall have been detected, or when the fossil species, of which Mr Sowerby, we believe, possesses several examples, shall have been described, we do not venture to determine.

M. D'Orbigny describes two recent species. The first, *Scissurella lævigata,* is smooth, or marked only by the lines of growth. The second, *Scissurella costata,* is ribbed, with the lower ones the most prominent and acute, and the pillar cavity surrounded by circular striæ.

The figures annexed (Plate VI. Fig. 3.) will convey a more correct idea of the shell than any description.

Manse of Flisk,
26th April 1827.

XVII.—*Account of an Optical Illusion called the Fairy Islands, seen on the North Coast of Ireland.*

In a Letter from Mr Samuel Thomas Gregg to Mr Stewart.

(Read 15th December 1827.)

Sir,

Having been an eye-witness, with five others, of the following optical phenomena, commonly called the Fairy Islands, in that part of the country where they are seen by the peasantry, but which I take to be the effects of the mirage, I thought an account of them might be interesting to your scientific friends, and I now send the particulars, that they may be added to the facts already accumulated on this subject.

The appearances in question occurred in September, and the morning of the day on which they were seen was so extremely hazy, that the Londonderry steam-packet could not proceed on her voyage till 12 o'clock noon, when the mist cleared off, and the day turned out fine, with a gentle breeze. The wind now changed to the east, and we were informed by the people that these phenomena are only seen when it blows from that quarter. A party, consisting of my father, brother, three sailors, and myself, went out on a boating excursion, from the White Rocks near Portrush, and on our return, at 5 o'clock in the afternoon, we first saw this optical deception make its appearance close to the Skerry Islands, which are situated in the sea, about four miles distant from the main land. We now saw a second set of Islands, at an extraordinary elevation, apparently 200 yards above the level of the sea, breaking off by degrees in the centre, the top branching into appearances resembling old castles, towers, spires, with men and cattle running over them! It sometimes also presented an appearance, which I can only liken (though it may appear whimsical) to a regiment of dragoons galloping and manœuvring! On our first observing the phenomena, the sailors cried out, "There's the Fairy Islands,"—the name given to these optical illusions by the peasantry. The appearances continued for the space of an hour and a half, and we remained a considerable time on our oars observing them,—but the evening began to close in with a thick mist, and the objects vanished from our sight.

The Skerry Islands where these phenomena occurred, are a small group of rocks a few miles out in the sea, and nearly opposite Portrush, being about six miles distant from the Giant's Causeway, Downhill, and Dunluce Castle. I mention these particulars with a view to explain the successive appearances. This phenomenon seems to be caused by the irregular refractions which the rays of light occasionally suffer, by passing through the different strata of the lower atmosphere. Now, there are old castles and spires on the coast opposite the Skerry Islands, where these optical deceptions occurred, and to account for the appearances just mentioned, the rays of light in passing through the lower strata of the air, should describe curves, whose final tangents point in the visual directions of the objects. Hence we may probably explain the appearances I have mentioned, being refracted in curves from the opposite coast, just as the shipping and buildings on the shore of Naples have sometimes appeared from Messina floating inverted in the atmosphere. I am Sir, your very obedient servant, SAML. THOS. GREGG.

P. S.—Mr Gregg's family are Quakers, and their veracity may be depended on. I am not, however, exactly certain whether these appearances could be reconciled with the theory laid down, taking into consideration the geographical position of the Islands, and the situation of the sun at 5 o'clock P. M.; but, as the sailors state that they only occur with east and north-east winds, they would seem to depend more on this cause than any other, and this would obviate any objections that might arise from the position of the sun at 5 o'clock. Mr Gregg is a medical student.

R. STEWART.

XVIII.—*On the question, whether Domestic Poultry were bred among the ancient Jews.*

By the Rev. DAVID SCOT, M.D. Minister of Corstorphine.

(Read 6th March 1830.*)*

COCKS and hens are the most common, as well as useful, of those tame fowls which we understand by the phrase domestic poultry, though ducks, geese, and even turkeys, are not excluded.

To us, with whom cocks and hens are so familiar, and who see them every day about the barn-yards of the farmer, or about the doors of the cottager, if we be brought up in the country, it may seem strange to doubt whether these fowls were bred among the ancient Jews.

There is, however, strong reason to think, that, for a long time, they did not know that there were such fowls, far less were accustomed to breed them. In the rural economy of Abraham, Isaac and Jacob,—in the sojourning of their descendants in Egypt,—in their continuance for forty years in the Arabian desert,—and in their settlement in the land of Canaan, till the Babylonish captivity,—it is not certain that they are mentioned or alluded to. Turtle-doves and tame pigeons seem to be all the birds which they kept for common and religious uses.

If any one is disposed to question the truth of these remarks, because fatted fowls are said to be served up at Solomon's and Nehemiah's table, let it be recollected, that the original words translated *fatted fowls*, are very ambiguous in their meaning; and, that the ablest critics are agreed that they do not signify tame fowls of any kind, but wild fowls caught in hunting.

In one passage alone, of all the books composing the Old Testament, in Jer. xvii. 11, Michaelis suspects that the hen is noticed, though he allows that this notice has been missed by commentators. It runs thus in the English translation: " As the partridge sitteth on eggs, and hatcheth them not; so he that getteth riches, and not by right, shall leave them in the middle of his days, and in the end shall be a fool."

This translation, as far as the partridge is concerned, is not very satisfactory; and on the margin of some Bibles, it has been altered into, " as the partridge gathereth young, which she hath not brought forth."

The name for the partridge in Hebrew is *kura*, and it has been given to this bird from its cry. As the hen resembles the partridge in some particulars, though not in its cry, Michaelis has thought that *kura* here may include the hen. In conformity to this idea, he translates, " The hen hatches, and clucks with the chickens of eggs not her own."

In order to make out this sense, he reads *degig* instead of *degir*, which, he thinks, has creeped into the text through the mistake of some transcriber; and it is not to be denied, that, by such mistakes, many passages of the Hebrew Scriptures have been corrupted, and the difficulty of finding out their meaning increased to modern scholars.

If we suppose the translation of this passage by Michaelis to be right, the sense given to the words will agree with the disposition of the hen as a mother. It is known to all, that she sometimes sits upon the eggs of another fowl, not of her own kind, and when they are hatched, clucks with the brood, as if they were her own; but they are not long of leaving their supposed mother, who is ill requited for her misplaced affection.

By the ill return which the brood makes to the hen, when hatched from eggs not her own, the prophet paints the vexation which the miser suffers, when he loses wealth, which he has gotten by unjust means. However cautious and watchful he may be to secure it, a time may come, when it shall escape from his hands, and leave him poor, destitute, and mortified; just as the brood of eggs, not her own, which the hen hatches, forsake her, when her affection for them is on the increase, if not at its height.

If this interpretation be rejected, we are led to conclude, that cocks and hens were not bred among the Jews, till they began to have intercourse with the Romans; and hence we are enabled to account for the spare mention of them in the New Testament. In this sacred volume, the hen is mentioned once, and the cock once, though it is doubtful, whether the mention of the cock be figurative or not.

The hen is thus introduced in our Lord's lamentation over Jerusalem: " O Jerusalem, Jerusalem, who killest the prophets, and stonest them that are sent unto thee, how often would I have gathered thy children together, even as a hen gathereth her chickens under her wings, and ye would not!"—Matt. xxiii. 37.

The passage is familiar to every Christian, and justly regarded as the truest burst of natural eloquence. One does not know, whether to admire more the pathetic simplicity of the expression, or the benevolent patriotism of him that uttered it.

The hen is timorous enough, when she has no brood, and runs away from those that approach her; but the case is different, when she is surrounded by her young. She then displays a courage and boldness, which repel and intimidate man and beast. She often puts dogs to flight, and sometimes kills rats, which are for devouring the eggs or the brood.

She is determined at all hazards to defend her offspring, and perish rather than desert them. Nothing can exceed her anxiety for their safety. It is lovely to see her bestirring herself to find out their food, and inviting them to the feast, without touching it herself. After they are satisfied, and disposed to rest, how does she cover them with her wings, and cherish them with her heat!

The maternal fondness of the hen is not more delightful to consider, than the striking manner in which the cock proclaims the dawn. He has long been celebrated as the herald of the morn, and to this office alone he is entitled, for the notice taken of him in the New Testament, if that notice be direct, and not metaphorical.

When our Lord's trial before the chief priests and rulers of the Jews approached, he is represented in Matthew, Luke, and John, as saying to Peter, "Before the cock crow, thou shalt deny me thrice;" but in Mark, "Before the cock crow twice, thou shalt deny me thrice."

In these accounts, there is no real contradiction. The other evangelists seem to have given the general sense of our Lord's expressions, but Mark his very words. Of course his account is more accurate, because more particular.

According to the Jewish reckoning, there were three cock-crowings; but heathen authors speak only of two. The cock, we believe, does not observe any set times. Certainly, he crows once during the night; often twice, and sometimes thrice.

As the cock crows once, twice, or thrice, in the approach of the night towards day, these crowings came at length to signify the times at which he crows, during this approach. These times coincided with two of those portions, into which the night was divided by the heathens. These were called watches, each consisting of three hours, more or less. The first began at six in the evening, and lasted till nine; the second at nine, and lasted till twelve at midnight; the third at twelve, and lasted till three in the morning; the fourth at three, and lasted till six, or the dawn.

The third watch was called the first cock-crowing, and the fourth, the second cock-crowing, because the cock, for the most part, crew twice, once during the third watch, and once during the fourth.

This division of the night into watches, is thus noticed by our Lord himself, as related by Mark, xiii. 35, "Watch ye, therefore, for ye know not when the master of the house cometh; at even, or at midnight, or at the cock-crowing, or in the morning."

This crowing of the cock, mentioned by Mark, corresponds with the fourth watch of the night; but when the cock is said, Mark xiv. 30, to crow twice, the third and fourth watches are intended; though the last of these, corresponding to the fourth watch, was, by way of eminence, named *alectrophonia* or *gallicinium*, or cock-crowing, and always understood when no other cock-crowing is the subject of discourse.

During night, sentinels kept guard in all the Roman armies. They repaired to their posts at six in the evening, by the blast of a shrill horn; and, with a blast of the same instrument, they were relieved at six in the morning.

In the course of the night, the sentinels were thrice changed, and each change was announced by the blast of a trumpet; only at the last change the trumpet blew thrice, according to some; but, according to others, the shrill horn blew thrice. Whether the one instrument was used, or the other, the three blasts, it is supposed, were intended to imitate the three times that the cock crew.

This last change was particularly and emphatically called the cock-crowing, as we have just said; but when two cock-crowings were spoken of, it was called the second, in opposition to the other, which was called the first.

A military detachment had long been stationed at Jerusalem, and the change of the watches, and the sound of the trumpet, which announced them, were perfectly familiar to all the citizens. This sound, when one watch succeeded another, was heard and attended to, as the sound of clocks among us, in the streets of large towns, to mark the progress of the night towards the day.

When our Lord signified to his apostles, that the time was at hand, when he should be delivered up to the Gentiles, Peter declared, that he would rather die with than forsake him; and so did the rest of the apostles. Our Lord, who knew his weakness, and the fall which was to follow, reveals to him, that, before the cock crew twice, he should deny him thrice.

According to this prediction, Peter denied his Lord three times before the second cock-crowing, at whatever time of the night that was. No sooner was the deed done, than the predicted sound reached his ear, and, at the same moment, the glance of our Lord's eye meeting his, overwhelmed him with shame, mortification, and sorrow.

From the strong impression made on the minds of the first Christians, by the crowing of the cock, which our Lord foretold was to follow Peter's denial, and precede his repentance, arose the practice, as it is supposed, of placing cocks on towers and steeples, attached to churches.

The crowing of the cock mentioned on this occasion, has given rise to much speculation; and, while the greatest part believe, that it was a real cock that crew; some contend that it was nothing but the blast of a trumpet at the beginning of the third watch, and repeated at the beginning of the fourth, by the Roman soldiers placed on guard at Jerusalem. Altman first suggested this idea; but it was opposed by Diotsma, both sensible men and considerable scholars in their day.

The discussion of the one is contained in the Biblioth. Brem. cl. v. fasc. iii., and the reply of the other, in the Mus. Brem. vol. i. p. 377., both literary journals in the north of Germany, during the last century.

The former maintains, that, when the trumpet sounded at twelve o'clock at night, the Romans, and after them the Jews, called this sound the first cock-crowing; and when it sounded at three o'clock in the morning, this sound was called the second cock-crowing.

The other contends, that a real cock crew both times, though the exact time of the night cannot be known; and that the opinion of his antagonist is a paradox, not supported by proof, that can convince a rational and inquisitive man.

To ascertain which opinion is most true, let us consult the words of the Evangelists. Those of Mark and Luke are more precise than those of Matthew and John. Mark says that the cock crew after the first denial, without specifying the time of the night; then the second denial was made; and at length the third, after which the cock crew again. Luke says the second denial was made a little after the first, and the third about the space of an hour after the second. In other words, there was nearly an interval of three hours between the first and the second denial.

If the blasts of a trumpet, at the beginning of the third and fourth watches of the night, were called cock-crowings by the Jews, as well as by the Romans, they might confidently be referred to, as events which would happen at fixed periods, before which Peter was to deny his Lord thrice; and as the blasts, supposed to be called cock-crowings, were three hours distant, they would very well suit the account of these denials given by Luke.

If persons were appointed to call the hours of the night in Jerusalem, as they are in most cities of Asia and Europe, and if two of these callings, some time betwixt midnight and morning, were named cock-crowings, they would also answer the account of Luke; but that they were so named, no where appears.

If real cock-crowings are allowed, they might easily correspond with the intervals of time, at which the denials succeeded one another, if our Lord foresaw that they were to correspond, however uncertain they might be as natural events; and he foresaw the coincidence of the cock-crowings with the denials, however these cock-crowings were underderstood.

Whichever of these explanations be admitted, whether a real cock crew twice, or the blasts of the Roman trumpet, at the beginning of the third and fourth watches, were called crowings of a cock; or two callings of the hours by watchmen, some time betwixt midnight and morning, deserved that name; the veracity of the Evangelists is not affected. The prediction of our Lord, that Peter was to deny him thrice, before the cock crew twice, and the fulfilment of that prediction, remain unaltered, however interpreted, and afford equally useful instruction to all honest and considerate men.

From the comparison of our Lord's concern for Jerusalem to that of a hen for her chickens, already noticed, we know, that this bird was in the country during his abode upon earth, and that the audience whom he addressed was well acquainted with an excellence belonging to it, by which he illustrated a remarkable feature in his own character,—the ardent affection which he had for his country.

The later Rabbies, indeed, have declared, that cocks were not suffered at Jerusalem, from the holiness of the place, and, that it was contrary to their religion, to keep them in Judea; but the reason which they give seems to be as unfounded, as their authority is suspicious. They say that they could not be kept, as they were reckoned unclean by the law of Moses; but if the Jews refrained from keeping them, they could not plead the command of Moses, by whom they are never mentioned; nor that of the prophets, by whom Moses was interpreted.

We have the mere declaration of these Rabbies, for judging them unclean; and to this they were led from hatred of the Romans, by whom cocks and hens were introduced to the notice of their countrymen; as well as of Christians, by whom the cock has been much attended to, from its mention in our Lord's last conversation with his disciples before he was crucified.

They scruple not to avow, that their forefathers did not breed this kind of domestic poultry, and that the Evangelists uttered a falsehood, when they asserted that our Lord told Peter, that he would deny him thrice, before the cock crew twice; a charge for which there is no proof; and until irresistible proof be produced, we are as much entitled to deny, as they are to affirm.

We may indeed grant, for the want of evidence to the contrary, that the Jews did not breed cocks and hens, till they were subjected to the Romans, who had long kept these birds, because they were fond of eating their eggs and flesh; and, as the Jews had ever been eager to adopt the customs of the neighbouring nations, so did they soon follow the example of the Romans, in breeding hens, as well as cocks, that the eggs which they laid might supply their table, and, that their flesh might be at the service of the cook, whenever it was wanted; and their experience soon informed them, that hen-eggs were strong, and hen-flesh sweet and nourishing food.

Even if the Jews of those days could not be reconciled to the eggs and flesh of domestic poultry, as a part of diet; they might be induced to keep them for sale to the Roman soldiers and publicans, who resided in Judea or resorted to Jerusalem. Whatever scruples they themselves might have to eating their eggs or flesh, to which their conquerors and lords were much addicted, they could have none to the sale of them to strangers, who might desire to purchase.

All their descendants, at least, have been guided by the love of gain, as the principal spur to their actions. The whole world is agreed, that no class of men ever knew better the art of making money, or were more successful in making it.

That the Jews of those days were accustomed at least to act as petty traders, we have positive proof. Though swine were held in the utmost abomination by the Jews, yet we learn from the gospel history, that these were common in Judea; and we cannot suppose that they were kept for any other purpose, than for sale to the Gentiles, who were very fond of swine's flesh.

From the grounds now stated, then, it may be concluded, that the Jews of our Lord's day were not prevented by the Mosaic law, from using as food the eggs and flesh of hens; or, if the tradition of the elders led them to view the matter in that light, they might breed them for sale to foreigners, just as they bred swine, from the profit which might be derived from their sale.

In the neighbourhood of the palace of the high priest, therefore, either in the houses of Jews or Gentiles, poultry might be kept, either for use or sale, and, as is customary with cocks, they would crow betwixt midnight and morning; and, as their instincts prompt them to crow several times, these might be named the first, second, and third crowings.

Even if we suppose that cocks were not allowed to come within the walls of the city, the house of Caiaphas the high priest was very near the walls; and if there was a cock belonging to any person without the walls, and there might be many persons who had cocks, the crowings of one or other of these might be distinctly heard in the house of Caiaphas.

It is a curious circumstance, that mankind have rather been late in taming and keeping domestic fowls. They are supposed to have come at first from the banks of the Phasis; or, at least, from countries south and east of the Euxine Sea; and their value increased, as men came to know the sweetness and excellence of their flesh, and the prodigious number of eggs, which they laid, above what is necessary to continue the race.

I cannot conclude these remarks, without expressing my unqualified abhorrence of cock-fighting. The practice, followed by some Britons, of pitting cocks against one another, till they are all killed but one, whatever be their number, is savage in the extreme; and that of the Sumatrans, who stake their wives and children, their brothers and sisters, on the result of the battle between their own cocks and those of their antagonists, is barbarity and insanity united.

At the first school that ever I attended, as many boys as pleased were desired to bring cocks on Candlemas day, and as few brought them, the deficiency was made up by the colliers of the village; but, if we wanted cocks, our attendance was indispensable, and there were we condemned, for six or seven hours, to witness these spirited creatures beating and destroying one another,—an excellent lesson, no doubt, to be taught young children, of consideration and mercy towards the inferior animals!

XIX.—*On the Origin of Domestic Poultry.*

By James Wilson, Esq. F. R. S. E. &c.

(Read 20th March 1830.*)*

The characters usually assigned by systematic naturalists to the genus of which the birds now under consideration form a part, are as follows :—

Bill of moderate length, but strong ; bare at the base. Upper mandible arched, rounded, convex, bent at the tip. Head surmounted by a fleshy crest, which is sometimes only rudimentary, or replaced by a plume of feathers. Chin wattled. Cheeks bare. Toes four in number: the three anterior united at their bases by a membrane as far as the first joint; the back toe elevated. Legs furnished with spurs. Tail composed of two inclined or nearly vertical planes, surmounted by more elongated central plumes, which are curved in the form of an arch.

The genus above defined has been bisected by M. Temminck. The second section, containing the beautiful Maccartney Cock (*Gallus Macartnii*, Temm.), is distinguished by having only the sides of the head bare, the crest composed of feathers, and the tarsi more elongated than in the other species. The first section, besides the bare cheeks, has also a portion of the anterior part of the neck bare of feathers.

In addition to the more precise characters above mentioned, it has been observed that a certain family resemblance, which cannot be easily expressed in words, not only unites these birds among themselves, but serves to distinguish them from the nearly allied family of the pheasants. The two genera which contain the cocks and pheasants are, however, so closely allied, as to render it in some instances a matter of no little difficulty to draw between them a decided line of demarcation. By the great Linnæus they were indeed included under a single genus, that of Phasianus, although much earlier authors, such as Gesner, Aldrovandus, Frisch, had shewn the propriety of forming that division called Gallus, since re-established as a separate genus by Brisson, Illiger, and others of recent date.

The aspect of the genuine Galli, if not fierce, is at least very bold and commanding. They carry their heads high, their necks upright, their bodies raised. Their tails are compressed and vertical, their cheeks bare, their throats wattled, and their heads usually surmounted by a fleshy crest or *comb*. Pheasants, on the other hand, besides being of feebler constitution, and consequently more difficult to rear, possess a more elongated form of body, which is usually maintained in a horizontal position; their tails are long and slender, and project nearly on the same level with the dorsal line, and their cheeks are covered by a tissue of very short feathers, of the consistence of velvet.

Of the many benefits which Providence has enabled man to draw from within the great circle of the feathered race, there is none which surpasses in extent and utility the domestication of those most familiarly known of all birds, called, *par excellence*, the Cock and Hen. So ancient has been the subservience of this species to the human race, that no authentic traditionary traces now remain of its original introduction to any of the more ancient kingdoms of the earth, and its existence under the protection of man, seems indeed coeval with the most antique records. It is one of those especial gifts, which, like the faithful and accommodating dog, may be said at an early period of the world to have joined its fortunes with those of the first families of the human race, to have followed man in his wonderful and far-spread migrations, and, adapting its constitution with facility to the varied circumstances of clime and country which these migrations produced, to have finally lost, in consequence of such plastic nature, almost all resemblance to the source from which it sprung. For some thousand years the observers of nature were ignorant of any wild species, which even in a remote degree resembled any variety of the domestic breed, and from the era of Herodotus to that of Sonnerat, the domestic cock and hen might have been regarded as birds, the living analogues of which were no longer known to exist in a natural and unsubdued condition.

In consequence of the remote obscurity in which the subject is thus involved, few points in natural history have occasioned more inconclusive speculation, or are even now more difficult to determine with precision than the source from which we originally derived the different races of our domestic poultry. That they came originally from Persia, has been inferred from this among other circumstances, that Aristophanes calls the cock "the Persian Bird." Such an origin is improbable, when we consider that the researches of modern travellers, and of all who have visited that country since the revival of learning, have failed to discover there any species of wild poultry; and although its ornithology is not yet known in detail, especially as regards the smaller species, that so conspicuous a feature in its natural history as the existence of the bird in question should have escaped the notice of recent inquirers, is by no means likely. In fact, no gallinaceous bird exists in Persia more nearly allied to the genus Gallus, than a species of Lophophorus. If, however, it is merely meant that the Greeks, during the intercourse, hostile or otherwise, which existed between them and the Persian nation, may have obtained a breed, previously domesticated, from that country, the appellation is less objectionable,—for it is known, that in a domestic state poultry have existed in Persia from a very remote antiquity.

It appears from the learned dissertation read at the last meeting of this Society by Dr Scot, that poultry were unknown to the ancient Jews, or at least that they are not distinctly alluded to in the Old Testament. It cannot, however, admit of a doubt that they were well known over many parts both of Europe and Asia, for several hundred years before the Christian era. When Themistocles took the field to combat the Persians, he alluded, while haranguing the troops, to the invincible courage of the cock;—"Observe with what intrepid valour he fights, inspired by no other motive than the love of victory; whereas you are to contend for your religion and your liberty, for your wives and children, and for the tombs of your ancestors:" and it was on this occasion that the Athenians achieved one of the most memorable victories recorded in history. According to Ælian, it was in commemoration of this signal event, and of the martial image by which the courage of the soldiery had been roused, that the Athenians instituted those annual games of which cock-fighting formed so conspicuous a feature. Themistocles died in the 65th year of his age, and about the 449th year before the Christian era. He must consequently have been contemporary with Nehemiah the prophet. Now, the Old Testament history does not conclude till about 20 years after the death of Themistocles, from which it may be inferred, that if the later of the sacred historians do not mention poultry, it must have been from some other cause than their ignorance of the existence of these birds; for, if the early Greek nations had received them prior to that period, either from Persia or from the more south-eastern countries of Asia, they could scarcely have been unknown in the intermediate regions inhabited by the Jews.

It may be mentioned as a curious fact, illustrating the extensive distribution of domestic poultry, that when the South Sea Islands were first visited by Captain Cook, they were found well-stocked with these birds; and the more recent, as well as more ample, narratives of the missionaries, have confirmed the statements of the great navigator regarding the practice of cock-fighting in Otaheite, and other islands of Polynesia.

" The most ancient, but certainly not the most innocent, game among the Tahitians," says Mr Ellis, in his Polynesian Researches, " was the *faa-ti-to-raa-moa*, literally, the causing fighting among fowls, or cock-fighting. The traditions of the people state, that fowls have existed in the islands as long as the people, that they came with the first colonists by whom the islands were peopled, or that they were made by Taaroa at the same time that men were made. The traditions and songs of the islanders, connected with their amusements, are as ancient as any in existence among them. The Tahitians do not appear to have staked any property, or laid any bets, on their favourite birds, but to have trained and fought them for the sake of the gratification they derived from beholding them destroy each other. Long before the first foreign vessel was seen off their shores, they were accustomed to train and to fight their birds. The fowls designed for fighting were fed with great care; a finely carved *fatapua*, or stand, was made as a perch for the birds. Their food was chiefly *poe*, or bruised bread fruit, rolled up in the hand like paste, and given in small pieces." "The natives," continues Mr Ellis, "were universally addicted to this sport. The inhabitants of one district often matched their birds against those of another, or those of one division of a district against those of another division. They never trimmed any of the feathers, but were proud to see them with heavy wings, full-feathered necks, and long tails." I may observe, that the breed of these islands do not appear to have been generally what in this country would have been denominated *game*-cocks, for Mr Ellis incidentally mentions, that as soon as one bird *avoided* another, he was considered as *vi*, or beaten. Victory was then declared in favour of his opponent, and they were immediately parted.

This barbarous custom has ceased among the inhabitants of the Friendly and Society Islands since the recent establishment of Christianity among them; although it is still pursued by the practical heathens of other and more ancient Christian lands. It is also continued in China, and in the islands of the Indian Ocean.

With the exceptions of North and South America, and the great Australasian Continent of New Holland, I believe there is scarcely any considerable portion of the earth's surface, colonized by the human race, where poultry have not been known and cherished from a very remote period. They are now spread over the whole interior of Africa, whether inhabited by Moors or Negroes. Their occurrence in the Society Islands, in the very centre of the vast Pacific Ocean, and at so great a distance from either the larger islands, or the continental parts of Southern Asia, is a singular circumstance in itself, and appears still more so when we consider their total absence from New Holland, a country almost continuously connected with the peninsula of Malacca, by means of Sumatra, Java, Timor, and other islands of the Indian Archipelago.

The different races of our poultry are so remarkable for the extraordinary disagreement in respect to size, colour, and proportions, which they exhibit, that the reflecting naturalist with difficulty convinces himself of their descent from one common stock. The smallest of the English Bantams do not weigh more than two pounds a-piece, whereas several varieties of eastern origin, such, for example, as the Great Cock of Java, sometimes exceed the weight of twelve pounds. In some the legs are long and bare of feathers, in others those parts are short and plumed to the very nails; and, instead of the bare crown, or fleshy crest which distinguishes the greater number of kinds, the heads of certain varieties are surmounted by a large tuft of loose elongated feathers. I need scarcely add, that the varieties in the colouring of the plumage are infinite.

These and other contrarieties, so greatly exceeding the utmost limits of whatever variation has yet been observed as the maximum of difference among the individuals of any clearly defined species, naturally lead us to inquire whether two or more species may not have been originally confounded under a mistaken identity of name and nature. Our knowledge of the natural history of the dog was long retarded by the erroneous views of Buffon, and others, who argued that all the known varieties of that four-footed Cosmopolite, must be descended from the shepherd's dog; and although the usually acknowledged test of specific identity, that of two individuals of different sexes producing a *fertile* brood, is supposed to have been conclusively applied in both instances, this I conceive does not so much prove that the multiform varieties which compose these so called species, are respectively referable to a single stock, as that the test itself, not being of universal application, is defective and improper. The test is this: Naturalists assert that if particular animals breed together, and their descendants continue to an indefinite period to produce fertile young, then they are one and all of the same species; as, for example, the canine race, all of which produce with each other a fertile progeny, and are therefore regarded as specifically the same; whereas the horse and the ass, though, under certain circumstances, they also breed together, produce animals called mules, incapable of continuing their kind, and the parents of which are, on that account, regarded as specifically distinct. Now, it is certain, that if this rule, after being established as true in fact, were to be applied to the various races of our domestic poultry, which, however different in appearance, certainly breed together, and produce fertile descendants, it might then be inferred that they were specifically the same. But, as the rule is not by any means established, as holding universally throughout the animal kingdom (of which the fertile hybrid between the ferret and polecat, and that between the dog and wolf, narrated by Buffon himself, in his Supplement, are familiar examples), I confess I would rather discard it altogether, than force facts to bend beneath so vague a generality.

In regard, however, to the origin of our domestic poultry, the first approximation to the truth (and I esteem it but an approximation), resulted from the discovery by Sonnerat, of a species of wild poultry, native to the Mountains of the Gates, in India. This is the *Gallus Sonneratii* of systematic naturalists, better known to the British residents by the now familiar name of *Jungle Cock*. Our knowledge, however, of gallinaceous birds has so greatly increased during recent years, and so many additional species have been discovered, that we are able to proceed upon much more secure ground in our present reasoning, than were the naturalists of the preceding century. The jungle cock is not only no longer the only claimant to the honour of having so greatly benefited the human race, but other species have become known which bear a resemblance so much closer to certain standard varieties among the domestic breeds, that his claims may fairly be considered as altogether set aside. In fact, several characters of the jungle cock have never been traced in any of the domestic varieties, and many of these latter present features which, if not incompatible with, at least bear no resemblance to any of the attributes of the supposed original.

It may be observed, that the natural *form* and *structure* of any portion of the animal organization are much less easily altered or effaced than the more superficial and transitory character of *colour* ; and hence if a particular species of bird be naturally distinguished by a peculiar consistence, as well as colour of plumage, the influence of those causes which produce variation more seldom affect the former than the latter. Reasoning, therefore, *a priori*, it would be more natural to expect that, if the jungle cock were the parent of our domestic breeds, such breeds, however they might vary in the colouring of their plumage, would at least at times exhibit those marked and peculiar characters of form and structure by which the feathers of the supposed original are distinguished. This, however, is not the case. Amid the infinite varieties which occur among our domestic poultry, the plumage of none is found characterized by those horny laminæ or expansions of the quill, which form so marked a feature in the plumage of the jungle cock, and which assuredly would have either continued a permanent feature, or been occasionally manifested in one or other of our domestic breeds, had these been mainly derived from the species in question. It is chiefly on account of this difference of structure of the cervical feathers, and of some other parts of the plumage, that we must seek elsewhere for the parent stock of our common poultry.

I may mention, however, another very decisive circumstance, which I am not aware has as yet been insisted on. The native tribes of Indians, inhabiting the districts where the jungle cock abounds, rear a breed of poultry which differs as much from the supposed original as our own, and which never intermingles with the forest brood. Perhaps nothing points out the distinction of species more strongly than this fact of their not seeking each other's society, when we know that even the pheasant, a bird of a different genus, frequently breeds with the domestic hen.

The same class of objections in regard to the structure of the plumage, holds good, and indeed in still greater force, against the fork-tailed cock (*Gallus furcatus*) from Java. The comb is entire, the throat is furnished with a single longitudinal wattle down its centre; and the feathers of the neck, instead of being narrow, lengthened, and acuminated, are broad, short, and rounded, and cover each other like large scales of velvet. This beautiful species abounds in the forests of Java, but its habits are wild and irreclaimable, and its disposition unfits it for domestication.

Still less can we trace the origin of our domestic breeds to the parentage of the Macartney Cock (*Gallus Macartnii*), one of the most beautiful of gallinaceous birds, distinguished by the greater comparative length of his legs, and the elegant plume of feathers which adorns his head. A remarkable difference exists in the appearance of the male and female of this bird. The species inhabits Sumatra.

The opinions of Gamelli Carreri on these and other points of natural history are of slight value. The observations of Dampier and Sonnini proved the existence of wild poultry in many of the islands of the Indian Archipelago; and although Sonnerat, from an undue anxiety to establish the truth of his own opinion in favour of the jungle cock, has treated the sentiments of these writers as conjectural, their value is not thereby diminished. It is now a well known fact, that wild poultry exist in most of the greater of the Asiatic Islands, and it is to one or two of these native species that I now beg to direct your attention.

According to M. Temminck, the species to which our domestic races are the most nearly allied, are, the *Jago Cock* of Sumatra (Gallus giganteus), a wild species, of great size; and the *Bankiva Cock* of Java, another primitive species, which occurs in the forests of the last named island. There are several circumstances which render the claims of these two birds much stronger than that of the Jungle Cock. 1*st*, Their females bear a strong resemblance to our domestic hens; *2dly*, The common village cock, in its most ordinary condition, is intermediate, in respect to size, between these two species; *3dly*, The nature of the plumage, which, in its form, consistence and distribution, is absolutely the same as in the common cock, greatly strengthens the supposition; *4thly*, It is in these species alone that we find the females, as well as the males, provided with a fleshy crest and small wattles;—characters which likewise distinguish both sexes of our common poultry, although they are, for the most part, but slightly developed in the females. The female jungle cock possesses neither comb nor wattles.

All gallinaceous birds, it may be remarked, are distinguished by the facility with which the different species combine to form hybrids or mixed breeds. Thus the cock and the female pheasant, and more frequently the pheasant cock and the common hen, produce a mixed offspring; the different species of Flocco not only breed together in a state of domestication, but those born and bred in captivity pair with the turkey; and M. Temminck is of opinion, that all gallinaceous birds which are susceptible of domestication, will also admit of cross-breeds, though of very different species. The objection, then, to our domestic poultry being derived from a multiplied source, which naturally arises from the acknowledged disinclination manifested by most animals (birds as well as quadrupeds) to breed except with their own kind, is greatly weakened, if not altogether done away with, in this particular instance.

The Jago cock (Gallus giganteus of Temminck) sometimes grows to so great a size, that, while standing on the floor of a room, according to Marsden, its bill attained the level of a dining-table of ordinary height; and when reposing on the ground with its legs bent beneath it, it was even then considerably taller than a domestic cock of the common size.

It is by the influence of this species upon our domestic races, that we have probably obtained those very large varieties, such as the Rhodian cock, the Sansevarre hen, and other eastern breeds, the weight of which (I mean of the males) occasionally ranges from 8 to 10 pounds,—an increase which we must have sought for in vain from the most pampered progeny of the jungle cock; for, judging from its general size and aspect, I should not think the latter would weigh above three pounds.

The second wild species to which I have alluded, is an inhabitant of the Island of Java. It is called *Ayam Bankiva* by the natives, a name of which I do not understand the etymology, though it probably expresses some characteristic habit of the animal to which it is applied. The species was discovered a good many years ago by a French travelling naturalist, M. Leschenault, by whom specimens of both sexes were transmitted to the Paris Museum. As its detailed description exists in several recent works on natural history, I shall merely observe, that it bears a very close resemblance to some of our domestic varieties, with which it also agrees in size, being much less than the Sumatran species, now before the Society. The female of the Bankiva cock is much less than the male. Her head is furnished with a very small comb, and her chin with very short wattles. There is a bare space around the eyes; the throat is also nearly bare, but in part covered with small feathers distant from each other, and between which the red skin is clearly visible.

The character by which the Bankiva cock and hen differ most strongly from domestic poultry, consists in the form and direction of the tail, which, in this wild species, is almost horizontal, and nearly vaulted, instead of being carried upright, and composed of two planes. This discrepancy, however, instead of forming a serious objection to the identity of these species, is, I think, easily accounted for by the different habits of the birds themselves. The magnificent plumage, which adds so much both of grace and dignity to the domestic breed, is partly an artificial character, resulting from that greater luxuriance of growth which never fails to follow a superabundant diet, and a life of idle indulgence. Nor have I the slightest doubt, from what I have more than once had an opportunity of observing, even in regard to our common poultry, that, if individuals of the domestic race were left to shift for themselves among the remnants of one of our ancient forests, the first change observable, as a consequence of the altered habits of their descendants, would be a decrease in the size and vertical position of the tail, which would gradually assume a narrower, more horizontal, and, if I may be allowed the expression, a more pheasant-like form and aspect. This change, in fact, would result almost mechanically from the altered action of the muscular system. Instead of strutting for ever on the ground, or basking on the sultry soil, the wilder brood of the forest would be furnished with a vigour of wing corresponding to their fear of danger, and which would both enable and incline them to frequent and rapid flight. Now, it is evident that all birds, to pursue an easy course through the air, must have their tails stretched out, on the same line with their bodies; otherwise their powers of flight would be greatly impeded. Hence it is that the peacock when alarmed, or about to seek safety in flight, instantly lowers his gorgeous train, so as to form a smooth continuance of the dorsal line; and, although I am not sufficiently skilled in anatomy to be able to say that this is absolutely and unavoidably necessary, I think it highly probable that a more minute attention to the subject would prove, that the upright position of the tail was incompatible, as a simultaneous act, with that vigorous muscular impulsion—called flight. Be this as it may, it is a matter of daily observation, that the boldest and most magnificently plumed cock of the domestic breed, when pursued by a dog, or otherwise forced to use his wings, immediately lowers both his head and tail; and I have had occasion to see this action more strongly manifested in an individual, which, having dwelt for the greater part of a summer in the woods upon his own resources, became so shy and wary, that he could neither be caught nor reclaimed, but generally rose with a harsh cry, at the distance of thirty or forty yards, with his tail extended *horizontally;* and was at last shot, like any other wild game, as a legitimate object for the exercise of sportsman-like skill.

I have entered into these apparently trifling details, because it has been objected to the Bankiva cock, that the nearly horizontal position of the tail formed so striking a distinction between him and our common breeds, that they could not fairly be considered as specifically allied; and it therefore became necessary for me to shew how probable it was, that, as domestication, in the one case, has added both to the extent and verticality of the caudal plumes,—so, on the other, a return to the natural habits of the species would cause a corresponding assimilation in form and structure to the parent source. I therefore do not conceive that a good argument can be adduced from the dissimilar forms of the tail, to prove that our domestic poultry are in no way descended from the wild Java cock, called Ayam Bankiva. In all other respects the resemblance is as perfect as can be expected to exist between birds, which for some thousand years have been influenced by domestication, and the original stock, which has continued to dwell unsubjected to any other modifying power than that of nature.

The conclusions which we are therefore entitled to draw from the preceding observations, are, 1*st*, That the Jungle Cock is *not*, as so generally supposed, the parent of our domestic poultry, from all the known varieties of which it differs materially, both in the form and structure of its plumage; and, 2*dly*, That, as far as it is possible to judge in the present state of our knowledge, that honour is claimed by two species inhabiting the Asiatic Islands, which respectively possess the principal characters of our domestic kinds, and are not contradistinguished by any marked peculiarity of structure.

XX.—*On the Okrub of the Ancient Hebrews, and Scorpion of the English Bible.*

By the Rev. David Scot, M. D., M. W. S., F. H. S. E.

(*Read 5th December* 1829.)

Among linguists and critics there has never been any doubt about the propriety of translating Okrub a scorpion. No one has ever experienced any difficulty in identifying this animal with that denoted by the Hebrew term.

Okrub is thought to be compounded of *ok*, to press, and *rub* much, or *kerub* near, because the scorpion brings together, holds fast, or squeezes, with its nippers, whatever it kills or devours.

The Arabic name is the same as the Hebrew, and is pronounced *kerb*, or with the article prefixed, *al kerb*.

It must strike every one, that in respect to shape, the scorpion and lobster resemble each other. This resemblance the Arabs had in their eye, when they termed the latter *al kerb ul bachur*, the scorpion of the sea.

In ancient geography, *Akrabbim*, high mountains on the north borders of Moab, stretching eastwards from the lake Asphaltites or the Dead Sea*, and afterwards called Akrabatane; *Akraba*, a city of Mesopotamia, not far from Harran*; and *Akrabene*, a region lying on the Tigris; were all so named, because they were infested with scorpions.

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* Mentioned, Numb. xxxiv. 4.; Josh. xv. 3.; Judg. i. 36.

This insect is found in Europe, rarely in France or Hungary, but often in Greece and Italy. It abounds in all the warmer parts of Asia, particularly India, throughout the whole extent of Africa, and the hottest part of America.

The scorpion has two arms, or fore-claws, in each of which are four joints, and at the end two nippers. These arms stretch round and beyond the head. Its head is a continuation of the trunk, which consists of seven or more rings. From each side of the trunk hang four legs, each being divided into six joints and two claws, here and there covered with hair.

To the last ring the tail is attached, in which globules or knots, from four to seven, are united by muscles, and these globules, it is thought, point out the length of the animal's life, one being added each year.

In the last of these globules the sting is placed, which is small, bent forward, and sharp, perforated by three very small holes, almost invisible, one at the upper part, and two at the sides of the tip, through which the poison is propelled. The poison is secreted by a gland, situated at the root of the sting, and this gland is pressed when the sting is used, and the poison thrown into the wound.

If the animal be not irritated, it trails its tail along the ground; but if it be irritated, it raises it over its back in the form of an arch, and strikes with all its force, whenever it finds, or imagines, an opportunity.

In some scorpions are eight eyes, in others six. There are two on the middle of the head, and two on each side of it, but placed near the mouth. The two nearest the mouth, which were discovered by Swammerdam, are very small. All of them indeed are small; but, from the kind of life which the animal leads, it has little need of eyes.

As far as the eyes are concerned, not to mention other

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* 1 Maccab. v. 3.

particulars, it resembles the spider, and therefore, with perfect propriety, it has been placed by Lamarck among the arachnides, or spider-like animals.

Scorpions vary in colour. They are brown, or iron-coloured; grey or ash-coloured. They are white or black, green or yellow. Those that are black and yellow are said to be most poisonous.

They vary also in length, being commonly from 1 to 6 inches long. Some may be longer in warm climates; but we can give little credit to those who assert, that in warm climates some are a foot, and even others a yard long.

We do not know whether the number of species has been ascertained; but about one species with wings, talked of by the ancients, and even not unnoticed by the moderns, we are somewhat sceptical. We even presume to say, that all scorpions are *aptera*, or creatures destitute of wings.

The female spins a web, in which she lays her eggs. These are not fewer than 26, and seldom more than 40. They are about the largeness of pin points, and contained in the bag, which the mother carries about with her, till they are hatched. When this process is over, the young ones get upon her back, and she covers them with her tail, and defends them with her sting.

Those who are ignorant of the natural history of this animal are puzzled what to think of such small creatures. Accordingly, some have mistaken them for ants, and of course given out, that the scorpion was pestered with these insects.

Scorpions hate the light, and court concealment. They delight in stony grounds, and in old ruins, and even in dwelling-houses. When they come into these, they lurk behind chests, benches or beds. In general they creep to all places in which they can find a cover or a defence.

They are carnivorous, or devour flesh. Their ordinary food is flies and small insects. They sometimes also devour one another, and in confinement at least, they do not refrain from devouring their young.

They have frequent combats with spiders and ants. The ants sometimes conquer; and when scorpions fear a defeat, they are said to kill themselves with a stroke on the head with their sting. The ants then drag away the carcass in triumph.

They are also said to kill themselves, when placed within a circle of burning coals. In this case they go round the inside of the coals for a minute, or so, and when no room for escape is discovered, self-murder is their resource.

When olive-oil is poured upon their bodies, they soon perish. This result is produced by the oil closing up the pores through which they breathe. These are situated at the lower end of the belly, and are eight in number, four on each side.

Mountebanks sometimes shew the gaping multitude that they can touch, and even eat scorpions; but they take care beforehand, to tie the nippers at the extremity of the arms, as well as the extremity of the tail, containing the sting.

The effect of the poison on the animal body, is thus described by Dioscorides, vii. 7: "The place which a scorpion has stung becomes inflamed and hard. It reddens by tension, and is painful at intervals; one while chilly, and another while burning. The pain rises high, and rages, sometimes more, sometimes less. Sweating succeeds, attended by starting, and trembling. The extremities turn cold, the groin swells, the hairs stand on end, the visage grows pale, and there is a sensation of pricking over the skin, as if from needles."

The symptoms enumerated by this author are not invariable. Symptoms occur in one case, which are not to be found in another; but whenever they are violent, we will be at no loss to understand the meaning of the Apostle John, when, in Rev. ix. 5., he speaks of "the torment of a scorpion, when he striketh a man."

The effect of the stroke is not always fatal. Those, who have been stung in Mexico and in Sardinia, have commonly recovered. Those who have been stung in Ceylon, India, Nubia, or Guinea, have often perished. The terror is sometimes greater than the danger.

Various medicines for counteracting the effect of the poison have been extolled by empirics, and even used with success. In such cases, imagination can do a great deal, and we have no doubt, that what is owing to the weakness of the poison, has sometimes been ascribed to the virtue of the medicine.

When convenient, immediate excision of the part stung has been resorted to, or the cautery applied, whether heated iron, burning coals, or an alkaline substance. In desperate cases, men will grasp at any thing which seems to promise relief.

This insect is most malignant, and if its power were equal to its rage, it would destroy every thing that came within its reach. Maupertuis, the celebrated French philosopher, put 100 of them into a glass vessel, and they had scarcely come into contact, when they began to vent their fury upon each other. At the end of two or three days 14 remained alive. All the rest had been killed and devoured.

The frequent mention of this insect in the Sacred Writings shews how formidable it was reckoned by the children of Israel. Thus, it is said, Deut. viii. 15, " God led thee through this great and terrible wilderness, wherein were fiery serpents, and scorpions, and drought; wherein there were no waters;" that is, when they marched through desert tracts under a burning sun, they were preserved from the most dangerous enemies, and the most appalling privations.

In 1 Kings xii. 11, Rehoboam uses these words to the Israelitish nation, " My Father chastised you with whips, but I will chastise you with scorpions," which words are repeated, 2 Chron. x. 11. Whips and scorpions were instruments of punishment; and if we consult Isidore's Origines, v. 25, he will tell us; "if a rod," or we may say a lash, "used to punish, be smooth, it is a whip; if it have knots or points, it is a scorpion."

Certain machines used in war, from the dreadful execution which they did among the enemy, were also called scorpions. Not to speak of other authors, they are mentioned, 1 Maccab. vi. 51, and are often met with in Cæsar's Commentaries.

The prophet Ezek. ii. 6, is thus addressed: "Thou, Son of man, be not afraid of them, neither be afraid of their words, though briers and thorns be with thee, though thou dost dwell among scorpions." Celsius and Hiller think, that by scorpions in this passage a species of thorns is meant, and that they were called scorpion-thorns by the Arabs, from the formidable appearance of the prickles, or the horrible pain which they inflicted on the animal body.

Though we are not hostile to this opinion, yet the sense of the passage will not suffer, if scorpions be a metaphor for men, who have the malignity of these insects, and do similar mischief to those whom they attack. Those, who have had much intercourse with society, or lived long in the world, know that there are scorpion-men as well as scorpion thorns.

In the same sense is to be understood this address of our Lord to his apostles, Luke x. 19, "I give you power, to tread upon serpents and scorpions, and over all the power of the enemy;" that is, from the aid which I give you, you shall be successful in the work which I send you to do, though it bring you into contact with men, who resemble serpents and scorpions in their dispositions, who can torture and destroy, like venemous reptiles and insects.

In Luke xi. 11, 12, occur these curious words: "If a son shall ask bread of any of you that is a father, will he give him a stone? If he ask a fish will he give him a serpent? If he ask an egg, will he give him a scorpion?"— the sense of which may be thus illustrated.

If a parent was so unnatural as to give his hungry son a serpent, instead of a fish; or a scorpion, instead of an egg; he would both deceive and disappoint him—he would deceive him, if he took a serpent for a fish, which it resembles; and a scorpion for an egg, which it also resembles, if the tail, legs, and arms are kept out of sight. If we call in question this resemblance, Bochart has quoted a sufficient number of examples to shew, that the scorpions about Judea resembled eggs, and if we can bring ourselves to believe that they were white, the resemblance will be still more complete.

The son would be disappointed, as well as deceived, if he took a serpent for a fish, and a scorpion for an egg. In neither case could his hunger be appeased, because men in ordinary cases do not eat serpents, and far less scorpions. These are not coveted, as food, when they are dead; because they are avoided, as causing destruction, when they are alive.

But if a parent, possessed of natural affection, will not deceive or disappoint his children, when they apply to him for the means of bodily support; far less, argues the Author of our religion, will the Parent of the Universe deceive or disappoint men, whom he considers as his children, if they seek the means of spiritual nourishment, never withheld, if properly sought, by which their religious and moral character will be perfected, and their true and everlasting happiness secured; or, to use his own words, verse 13, " If ye then, being evil, know how to give good gifts unto your children, how much more shall your Heavenly Father give the Holy Spirit" (or, in the parallel passage, good things) " to them that ask him?"

XXI.—*Description of a Species of Arvicola common in Aberdeenshire.*

By Mr W. Macgillivray, M. W. S.

(Read 1st May 1830.)

The mammiferous land animals of Great Britain might naturally be supposed to have received abundant notice, and the more so in proportion to their paucity and their importance in the scale of creation. That this, however, is not the case, is notorious. The more common mammiferous animals are indeed known to us by name, but while each of these might form the subject of an extended memoir, we have as yet only brief and unsatisfactory notices respecting them. But novelties may yet be found; and it is hardly necessary for me to offer an apology for requesting a moment's atttention, while I lay before the Society an account of a new species of Arvicola, whose habits I have had opportunities of observing for several years.

The animal in question is very common in many parts of the counties of Aberdeen and Banff, where, among the vulgar, it bears the names of *Black Dog* and *Water Dog*.

It resides in holes of its own digging, in the grassy banks of brooks and rivulets, feeding upon vegetable substances. In structure, form and habits, it closely resembles the Common Water Rat; but in colour, and certain other less palpable traits, it differs from that species, as much at least as the Black Rat differs from the Brown Rat, or the latter from the Mus giganteus. To the superficial observer, it has little of the aspect of a rat, its black colour giving it at a distance the appearance of a mole. Had I merely inspected a skin or two, I should have hesitated to speak decidedly as its claims for specific distinction; but having seen several hundred individuals, and handled at least a dozen, I may be allowed to introduce the animal to the notice of naturalists.

The following description is applicable to the male and female.

The head is short, broad, rounded, and slightly convex above; the body thick and heavy, nearly cylindrical, tapering from the lower part of the belly to the tail; the limbs small, their extremities delicate; the tail longish and slender.

The snout and nostrils are small; the canine teeth, as usual in the order, large and apparent externally; the eyes small; the external ears entirely concealed in the fur, membranous, erect, broad, rounded, of moderate size, internally bare, excepting at the margin, slightly covered externally with extremely soft fine hairs. The meatus is very large, and capable of being exactly closed by a thin angular operculum, with a thickened margin.

The fore feet have five toes. The first toe or pollex is very small, with two phalanges, the claw alone appearing externally; the second nearly equal to the fourth; the third a little longer; the fifth much shorter than the fourth; all with three joints. The claws are slightly curved, very weak, extremely compressed and bluntish ; that of the first toe semi-elliptical. The sole presents two papilliform tubercles opposite the first toe, two small tubercles at the base of the second and fifth toes, and a fifth between the roots of the third and fourth.

The hind feet have also five toes. The first is short; the next three are of nearly equal length, the middle one a little longer; the fifth much shorter, but longer than the first; the first and fifth have each two joints, and are opposable to the others ; the others have three phalanges. The claws are longer and a little stronger than those of the fore-feet. The sole, which is bare to the tarsal joint, has two tubercles at the root of the first toe, one after the other, a tubercle at the root of the second toe, another at the root of the fifth, and one between the third and fourth.

The tail is perfectly round, slighly tapering, regularly scaled, and covered with moderately long stiffish adpressed hairs.

The fur is longer on the upper, and especially on the posterior parts, close, long, silky, composed of two sets of hairs, some being longer and a little thicker, others shorter and finer. There are four rows of long mystachial bristles on the upper lip on each side. The hair of the feet is very short, and adpressed.

The teeth are pale brownish-yellow; the eyes dark brown. The general colour of the fur is black, slightly tinged with brown above, greyish beneath. The short pile is dark bluish-grey. A few white hairs appear here and there in the fur. The short hairs on the margin of the lips are greyish-white, and those of the feet dark bluish-grey. The snout is flesh-coloured; the auricle whitish; the soles flesh-coloured with bright red papillæ ; the claws yellowish-grey, with a bright red spot near the extremity.

The two upper canine teeth are of moderate size, slightly curved, convex transversely, chissel-shaped, close, even at the end. The two under ones are long, curved, somewhat cylindrical, rounded at the end, sharp-edged, and sloping externally, chissel-shaped. There are three grinders above and below on each side, in a straight very close series, with the sides forming perpendicular ridges and grooves, the crown narrow, flat, and presenting a zigzag appearance. The first upper grinder has three internal and three external ridges; the second, which is smaller, has two internal and three external ridges; the third, which is smaller, but as long in the crown, has three internal and four external ridges. The first lower grinder, which is equal in size to the two others, and much larger than that of the upper jaw, has five internal and four external ridges; the second has three internal and three external ridges; the last has also three internal and three external.

Internally of the mouth, at the commissure of the lips, is a tuft of whitish, shining, bristly hairs, directed inwards, downwards and backwards, from a thickened callous surface. The palate is tuberculate: the first or anterior tubercle, small and triangular; the second broader and thicker; the series then separates into two, and terminates with two smaller on each side, opposite the first grinder. The tongue is longish, somewhat cylindrical, smooth, and of a carmine-red colour. The stomach is rather large, double, or divided into two portions by a contraction, its internal surface covered with flat tubercular patches. The rest of the intestinal canal is extremely thin in its walls. The small intestine enters the large at right angles. The latter presents an enormously large convoluted cœcal extremity, occupying the right side of the abdomen. The liver is large, with four nearly equal lobes, lying over and partly enclosing the stomach. The kidneys are also large, reniform, with a very distinct renal capsule.

The *male* is of a deeper black than the female, and rather larger. The testes are oval, and of very large size. A fine specimen shot by me at Aberdeen in March 1817 was 8 inches long from the nose to the tail; the latter 4 inches long; its circumference behind the fore-feet 5 inches. A specimen procured for me by my friend Mr Craigie from the Rev. Mr Cowie of Cairney, near Huntly, in April 1830, was 7½ inches long, the tail 4 inches, the circumference 5.

The *female* has four abdominal teats. The length of an individual sent to the College Museum in December 1829, was from the nose to the tail 6¾ inches, the tail 3¼. In this individual the length of the intestinal canal was 6 feet 10 inches, exclusive of the cœcum; while in a common water rat, of much larger dimensions, it was a foot shorter.

This animal is found in the eastern part of the middle division of Scotland, by the margin of small streams, with grassy banks, in which it burrows. Of the holes which it makes, some open above, and others beneath the water. In the morning, from sunrise to about ten, they may be seen near the mouths of their holes, feeding upon the grass, or basking in the sun. If they become torpid in winter, their period of hibernation must be short, as I have seen them in December and early in March. In the stomach of an individual killed in December, I found the root of a plant, apparently a rumex, and in others killed in spring, summer and autumn, the green leaves of grasses and other plants. They swim well, take the water readily, and dive with ease. When surprised at a distance from their holes they prefer swimming or diving, to attempting a land race, although on shore they are very active. Their toes, however, are not connected by the smallest vestiges of a membrane. They are shy and vigilant, but frequently allow a person to approach within thirty yards; and I have several times stolen so close as to kill them with a stone. They never come near houses, and do no injury to the crops. In all the places where I have seen them, the common water rat was unknown; nor have I ever observed any other than a very slight variation in the tint of the black fur. Although pretty numerous in many places, they no where swarm like the common or the black rat.

The general description of the Common Water Rat is almost the same as the above. In the latter, however, the fur is light brown with some dark hairs, much shorter and less close; the external ears are much more covered with hairs, and less concealed by the fur; and the tail is a little compressed towards the end. The size is also larger. Another difference, which by many would be considered more important, exists in the number of the caudal vertebræ; but, unfortunately, my notes on this subject do not apply to a sufficient number of individuals.

When I have completed my observations on these species, I shall give a more detailed description of the present, together with a full account of the other; respecting which there are many inaccuracies in our books, some authors saying that its feet are webbed, which is not the case, that it swims with difficulty, which is not true, and that it feeds on fishes, which appears more than doubtful. In the mean time the two species may be characterized as follows.

Arvicola amphibius. Brown Water Rat.—Fur pale reddish-brown, mixed with dark brown hairs above, light grey beneath; tail short, round, slightly compressed towards the end.

Arvicola ater. Black Water Rat.—Fur black, dark bluish-grey beneath; tail short, round in its whole length.

The naturalists of Aberdeen have abundant opportunities of completing the description of this animal, it being plentiful along the banks of a stream which washes the garden wall of the University of King's College.

XXII.—*On the Mustard Plant mentioned in the Gospels.*

By the Rev. David Scot, M. D., M. W. S., F. H. S. E.

(*Read* 20*th Feb.* 1830.)

In order to ascertain, if possible, what plant in modern botany answers to the mustard of the gospels, we must examine the terms in which it is mentioned. It is thus spoken of, Matt. xiii. 31, 32, " The kingdom of heaven is like a grain of mustard seed, which a man took, and sowed in his field, which indeed is the least of all seeds, but when it is grown, it is the greatest of herbs, and becometh a tree, so that the birds of the air come and lodge in its branches."

This is the first passage of the gospels in which the mustard plant is mentioned; but in endeavouring to identify this plant, the other passages in which it is mentioned, and particularly that of Mark, are carefully to be compared.

By the mustard plant, which grows from a small seed to a tree, Christ intended to represent, by a very common, but striking symbol, the small beginning and great increase of that religion which he was to establish in the earth. Arising from the obscure country of Judea, in the course of four centuries it was to triumph over the inveterate and deep-rooted superstitions of the times, and be professed and supported by the most enlightened and civilized nations of Asia, Africa, and Europe.

The symbol referred to being a mustard plant, we are not to suppose he was to enter into a minute and circumstantial detail of that plant. We may be certain that he used popular, and not philosophical language, when he mentioned it; that is, language familiar to ordinary men, and not that spoken by men of science.

When, for instance, he invites his audience to consider the parable of the mustard seed, he says, that it was the least of all seeds; that is, it was the least with which the people of Judea were acquainted, or to which they attended; not the least in a mathematical sense, or the least from which a vegetable ever grew. All that he meant, and all that his hearers understood, was, that it was very little among seeds, or a very little seed.

A grain of mustard seed was a common measure for a small quantity of any thing. Thus our Lord says, Matt. xii. 20, "If ye have faith as a grain of mustard seed, ye shall say unto this mountain, Remove hence to yonder place, and it shall remove." Again, Luke xvii. 6, "If ye had faith as a grain of mustard seed, ye might say to this sycamore tree, Be thou plucked up by the roots, and be thou planted in the sea, and it should obey thee."

In both passages, that faith is meant which theologians call the faith of miracles; a faith which the apostles and more eminent first Christians alone could exercise, and if of a right quality when so exercised, was followed by a miracle, though it might exist in a small degree, or be as little as a grain of mustard seed.

That the phrase, the least of all seeds, means no more than very little among seeds, or a very little seed, is evident from two similar phrases used by our Lord—"There hath not risen among men a greater prophet than John the baptist, and yet the least in the kingdom of heaven is greater than he." Matth. xi. 11. Again, "He that shall break one of the least of these my commandments, and teach men so, he shall be least in the kingdom of heaven;" Matth. v. 32.

These two phrases, similar to the one under consideration, countenance the idea, that though one person in the kingdom of heaven, or one commandment of Christ, may be strictly and literally the *least;* yet no more is intended, than a little person, or a little commandment.

The soundness of this interpretation is confirmed by the contrast betwixt the person that taught men to break Christ's commandments, and him that taught men to keep them. Of the latter it is said, he shall be *great* in the kingdom of heaven, in opposition to the former, who might be called *little*, though the term *least* is used.

The same account, which we have given of the least of all seeds, is to be given of the greatest among herbs. By that phrase no more is intended, than a very great herb, or an herb great in comparison of the seed from which it grew; though, mathematically speaking, there might be greater herbs from smaller seeds,, if they had been known or attended to.

Lachanon is defined, in Turton's Medical Glossary, to be any cultivated or garden herb. Such an herb gets this name from *lachaino* to dig, because the earth is digged, in order that it may reach its full growth at the proper time. *Lachaneuo*, with which *lachanon* is connected, signifies—to gather herbs, to live on herbs, to be good for eating as herbs. That *lachanon* is an eatable herb, is confirmed by the words of Paul, Rom. xiv. 2, "another, who is weak, eateth herbs."

This account of *lachanon* is decisive of the kind of herb, which that word denotes in the gospel. It is an herb cultivated in the farm or garden, for the use of the kitchen, and not one growing in the fields, neglected or disregarded.

The seeds of the poppy, fox-glove, tobacco, crowfoot, and so forth, might be less than that of the mustard; but the plants which grew from them, might not be so great, as that which grew from the seed of the mustard; or if any of them were greater, the fact might not be noticed or considered.

A similar account is to be given of the phrase—it becometh a tree. This is an elliptical expression, for it becometh into a tree—*gignetai eis to dendron*,—that is, it had the size, as well as the height, of what in ordinary language is called a tree.

Luke's language is somewhat stronger. It waxed a great tree; but as the size and height of trees are so various, what is simply called a tree by one, will be called a great tree by another. The expression is merely relative, and according as you compare it with other trees, it will either be great or little.

Not to be more minute, the word *tree* is of far more extensive meaning in the sacred writings, than our use of that term will justify. Any vegetable a little taller or bigger than ordinary, is called a tree in these records; though it might only be a herbaceous plant, which has neither the firmness nor hardness of what is called a tree in our times.

It is necessary to be particular in explaining this kind of language, because, if it be understood strictly and literally, the mustard plant of the gospels cannot be the same, which is now known by that title.

We must recollect, however, that the doctrines which the sacred volume teaches, are not so carefully expressed as if they were mathematical axioms; nor the articles of natural history, which it brings forward to illustrate these doctrines, ascertained to be correct by a Linnæus or a Cuvier.

The strict and literal interpretation of the loose, inaccurate, and figurative language of Scripture, is one cause of the numerous sects into which the Christian church has been split for eighteen centuries. The Bible is an oriental composition, or a highly poetical and rhetorical work, which is to be judged of by the man of good sense, rather than by the votary of science; otherwise it will be made to countenance errors in religious and moral doctrine, as well as in natural history, and abstract science; which it will be very difficult to believe were dictated by a Divine Spirit.

Still farther, the mustard plant spoken of by our Lord grew in a highly favoured spot. The grain of mustard seed which a man took, he sowed in his own field; that is, it was not sown on ground which had received no culture, but on ground cultivated with the utmost care. It was not pasture, but arable land, not a waste, but a spot turned up, cleaned, and manured.

That this is the right interpretation of the word field, is demonstrated by the use of the word garden, in the parallel passage of Luke xiii. 19. "The kingdom of God is like a grain of mustard seed, which a man took, and cast into his garden; and it grew, and waxed a great tree, and the fowls of the air lodged in the branches."

Here we see that a man planted a grain of mustard seed in his garden, a place enclosed by hedges or walls, which was receiving accessions of earth and manure every season; and upon which the spade and the rake were employed, whenever it was necessary.

In any climate, the difference of soil and situation causes a prodigious difference in the growth and size of plants.

Will the plant, for instance, arising from the grain of mustard seed, dropped into barren, unprotected, and neglected land, whether in Judea or in great Britain, bear any comparison, either in freshness or stateliness, with that which arises from the grain dropped into land, laboured, sheltered, and enriched? What will a mustard plant be, growing in a farm or garden in Judea, which is warm, compared with one in a similar situation in this country, which is cold? Would not the plant of this country be little in size, and stunted in growth; while the plant of Judea far exceeded the stature of a man, and spread into branches, in which the birds of the air took up their abode?

A mustard plant does not properly consist of a single stem, but a number of branches going off at angles. These are clothed with leaves, large and close, capable of concealing the fowls of the air, which light upon, or hop among them.

Though the phrase—fowls of the air—used by Luke, has a magnificent sound, yet we are persuaded, that the smaller of the feathered tribes are meant; or as they are also called by Matthew, the birds of the air.

Now birds of the air lodge in the branches of this plant, in our extended fields of mustard. Its leaves conceal them from the eyes of men and other animals: though they no more build their nests among such plants, than they are said to do in the mustard plant, mentioned in the Gospels. Some, indeed, have given that turn to the phrase, lodging in the branches; but, assuredly, that phrase does not mean nestling, or building a nest, but sitting among the branches.

There are three species of mustard known in Britain, the wild mustard, the white mustard, and the black mustard. Whether these kinds of mustard are known in Palestine, we have not heard. Hasselquist mentions three kinds, the treacle mustard, the buckler mustard, and the tower mustard, as certain plants are called in the English translation of his work; and Russel, in his History of Aleppo, besides monospermous charlock, field charlock, and mountain charlock, mentions field mithridate mustard, mountain mithridate mustard, and bastard mithridate mustard.

It is desirable that the history of all these plants should be given, before we determine about the species of mustard, mentioned in the Gospels; and travellers into western Asia, or systematic writers on Botany, ought to be consulted, who have left notices, or published accounts of these plants.

The black or common mustard, which is an annual in Britain, and never rises above two or three feet, cannot with any propriety be called a tree; but if this plant, as some have said, exist more than one season in Palestine, or finish its growth in two years, and rise to the height of ten or twelve feet, it may have some of that woody texture, which may justify the language of the country in calling it a tree.

That the plant which the ancient Jews called mustard, grew to a considerable height, and that its branches were fitted to be a resting place to birds, and a shelter to men, Rabbinical assertions anthorize us to believe. In the Jerusalem Talmud, one relates, that he had a mustard plant in his farm, which he was accustomed to climb, as if it had been a fig-tree. Another in the same record speaks of a mustard tree, which had three branches, one of which, when torn down, afforded a shade to a potter while working during summer weather, and from which three cabs of seed were taken, or three pints one-third, English measure.

As a proof of the height at least, to which the mustard plant grows in Syria, we may quote these words from the travels of Captains Irby and Mangles, Letter v. page 354, "We think it probable, that this is the tree our Saviour alluded to, in the parable of the mustard seed, and not the mustard plant, which we have in the north. For, although in our journey from Byson to Adjeloun, mentioned in the

Jerusalem letter, we met with the mustard plant growing wild, as high as our horses' heads, still, being an annual, it did not deserve the appellation of a tree, whereas the other is really such, and birds might easily and actually do take shelter under its shadow."

The plant which these gentlemen thought to be the mustard tree, alluded to by our Saviour, Mr Lambert and Mr Don found to be the *Salvadora persica* of Linnæus, the Embelia grossularia of Retzius, and the Cissus arborea of Forskael, Edin. New Phil. Journ. No. iv. p. 307.

The mustard plant, which they saw growing wild between Byson and Adjeloun, high as their horses' heads, Mr Don says, " was probably Sinapis nigra, which in Spain grows from ten to fifteen feet, as I am informed by my learned friend Don Mariano Lagasco."

Captains Irby and Mangles declare, that " they were prevented from admitting this plant to be the mustard of the Gospels, because, being an annual, it did not deserve the appellation of a tree." To this remark we beg leave to add. Certainly it did not deserve the appellation of a tree, in our sense of that word; but it might very well deserve it in the sense in which *tree* is understood in the sacred writings.

The uncommon size of an herb, in a hot country, is not to be wondered at. Herodotus, in the first book of his history, declares, " that in the country of Babylon, he could not mention the immense height to which the millet and sesame grew, though he had witnessed it himself, lest he should seem to violate probability."

The mock orange of America also gives a satisfactory illustration of the account given of the mustard plant in the Gospels. If the seed be sown in a garden at New York, the plant growing from it rises to the height of ten or twelve feet, in the course of six or eight weeks; while its branches, covered with leaves, hide the feathered tribes from observation; and afford shelter to the people of the house, if they choose to sit down under its shade, during the heat.

The words of Mark iv. 30, 31, 32, do not carry us beyond this idea of the mustard plant. "The kingdom of God is like a grain of mustard seed, which, when it is sown in the earth, is less than all herbs, and shooteth out great branches, so that the fowls of the air may lodge under the shade of it."

This passage of Mark deserves the careful study of those, who wish to come to a positive determination about the mustard plant of the Gospels. Matthew and Luke wrote their Gospels chiefly for the use of their own countrymen; but Mark for the use of foreigners, as well as natives; and when civil institutions are mentioned, or articles of natural history alluded to, he is rather more distinct and correct than Matthew and Luke.

Of course, whoever judges of the mustard plant of the Gospels, ought to take the account of Mark for the test, by which he is to judge of the accounts of Matthew and Luke. If this be the rule which he follows, he will conclude the mustard plant to be one of those vegetables commonly called an herb, though of large dimensions, and possessed of branches, capable of lodging and sheltering the fowls of the air.

We are to bring down our ideas a little, therefore, when we think or speak of the mustard tree of the Gospels. We are not to imagine that it resembles an oak or an ash, when they are full grown; but be persuaded that it is a herbaceous plant, favoured by climate and soil, and finishing its growth in one, or at the most, in two years.

If these remarks be not kept in view by those who inquire into the mustard plant of the Gospels, they will be unable to reconcile the account of it there given, with its appearance in their own country, because they are strongly influenced by associations formed in early life, when they judge of the productions of other countries.

Even scientific botanists, who have not weighed well the popular, poetical, and rhetorical language of the sacred writings, have been at a great loss what to determine concerning the mustard plant of the Gospels; and, after studying the subject for a time, given it up in despair.

Mr Frost, F. A. S. with laudable zeal, has endeavoured to ascertain what plant in modern botany answered to the mustard plant of the Gospels; and, after much consideration, he has come to the belief, that the mustard plant of the Gospels was not any plant to which we now give that name, but a species of phytolacca, viz. the phytolacca dodecandra of Linnæus.

This result of his inquiries first appeared in the 20th volume of the Journal of Sciences and Arts, and in 1827 he published it as a separate treatise, in 8vo. with an engraving of the plant.

This plant, he affirms, grows abundantly in Palestine. It has the smallest seed, and rises to the greatest size, of any plant in that country. Its seed is used for culinary and medicinal purposes, as well as that of the common mustard; and in America, it goes by the name of mustard. On these grounds, he thinks that there is the highest probability that it was included by the ancients under the name of mustard.

We have two questions to ask. Is he certain, that a Jew was accustomed to take the seed of the phytolacca dodecandra, and sow it in his field or garden? If it grew in the mountains, or valleys of Palestine; if it was a tree in the forest of Lebanon, or in the wood of Ephraim; it could not be the mustard of the Gospels, which a man took and planted in his field or garden, a spot dedicated to labour, in order to be improved for the sake of the produce.

The following is the other question which we have to ask. Does it finish its growth in one or more seasons? A man seldom plants any vegetable in his field or garden, except that which brings a return within the year; and if the phytolacca dodecandra take many years to finish its growth, it cannot be the mustard of the Gospels.

It is to be regretted, that Mr Frost has neglected to authenticate the materials on which he grounds his reasonings. Without this authentication, the conclusions which he draws from his premises may be perfectly just, and yet these premises a mere bundle of sand.

" It would seem," says Mr Don, Edin. New Phil. Journ. p. 308, No. iv. " that some common agricultural (or horticultural, Mr Don might have added) herb, of large growth, had been intended by our Saviour; but whether the plant belongs to the same family with Sinapis of Linnæus, and for what purpose it was cultivated, are questions rendered quite problematical at this distant date."

After using these words, Mr Don goes on to observe; " we are pretty certain, however, that it cannot be a phytolacca, for it does not appear that any real species of that genus has been observed in Palestine."

Without relying on any authority, if the phytolacca of Mr Frost was not a plant familiar to every one, such as that which grows in a field or garden; if it did not grow from a small seed to a large size, in two at least, if not one year, it could not have been mentioned in a popular discourse, as a fit image to represent the rapid progress and wide spread of Christianity, which, when Christ delivered the parable of the mustard seed, was despised by most, and embraced by few; but, while it was reared upon Judaism, it was, in the course of four centuries, to supersede heathenism, and become the established religion of a great part of the Roman empire.

From all these remarks, though we assert nothing positive, we are persuaded those will not err greatly, who believe the mustard plant of the Gospels to be an individual of the common mustard of our times, or Sinapis nigra of Linnæus.

All persons of candour and judgment will perceive, that it was not a tree, strictly so called, but an herb raised on the farm, or in the garden, on which much attention was bestowed by the proprietor, and which enjoyed the advantage of a rich soil, and a warm climate; grew to the height of twelve or fifteen feet, and shot out branches which sheltered birds, and even men.

A judicious and enlightened examination of the language, used concerning the mustard plant, is the true method of deciding with which plant in modern botany it corresponds. This is not the language of professed botanists, or learned naturalists; but the language of ordinary life, in which more, or even less, may be meant than meets the ear. From a proper consideration of this language, we may arrive at the truth, but without such a consideration, our arrival at it will be a matter of chance, as well as uncertainty.

Grammarians have been divided about the origin of Sinapis—the Greek name of the mustard plant. We think all the etymologies of it mere drivelling, except that of Hiller, who makes it compounded of two Chaldaic words, Sina Appa, biting the nose, from the effect which the particles, issuing from the bruised seeds, have on the olfactory nerves. Such seeds, when bruised, also nip the nerves of the eye, when held over it, and cause it to water.

The seed of the mustard, when reduced to powder, has long been taken along with food, in order to assist digestion, and when the bowels are slow, to promote regular evacuation.

The plant is cultivated by gardeners or farmers, for the sake of the seed reduced to powder; and is intended to be used in their own families, or for sale to others who use it.

The seed, it is probable, was sown for the same purpose among the Jews as among us. As it might be a profitable concern, a Jew would be encouraged to sow it in his field or garden. Being a marketable commodity, he might calculate upon an adequate reward for his labour.

The common mustard, it need hardly be noticed, belongs to the class Tetradynamia of the Linnean arrangement of plants, or those which have six stamens, two of which are shorter than the other four; and to the order Siliquosa, including those plants the seeds of which are contained in pods.

XXIII.—*A Catalogue of Coleopterous Insects found in the neighbourhood of Edinburgh, with occasional reference to their localities.*

By Mr James Duncan.

(Read 19th March 1831.)

The Insects enumerated in the following Catalogue are indigenous to the district around Edinburgh. They have been collected within six or seven miles of the city, except in a few instances, where these limits have been exceeded, in order to admit certain rare or otherwise interesting species. The list has been prepared under the impression that it would be advantageous to those who may hereafter study the subject in this part of the country, to know what insects are likely to occur, and in what places they may most readily be found. It has been restricted, in the mean time, to the Coleoptera, from a desire to make the enumeration of that order as complete as circumstances would admit. It is the branch which is most commonly studied, and it is also considerably more extensive, as well as more difficult, than the others; while, at the same time, the important functions which its members perform in the economy of nature, and the injurious consequences which not unfrequently result to the farmer and the horticulturist from their superabundant increase, render a knowledge of their special haunts and general distribution more than usually desirable.

Many years ago a similar list was drawn up by the late Mr Charles Stewart, and published in the first volume of the Memoirs of this Society. It embraces all the Linnean orders, and gives a brief enumeration of the more common species belonging to each. None of the minute kinds are included, and it is confessedly very defective even in those of a more conspicuous description, excepting in Diurnal Lepidoptera, to which but few additions have since been made. Of coleopterous insects scarcely more than an hundred are recorded; two or three of these, however, are rare, and have not since been met with in the district to which the list refers. The vagueness of the Linnean descriptions (which Mr Stewart seems chiefly to have consulted), or at least the extreme briefness which renders their determinate and exclusive application sometimes rather difficult, amid the now greatly increased amount of species, has, however, unfortunately led him to introduce the names of several insects, not known to be indigenous to Britain. Advantage has been taken of the more accurate knowledge of synonymy which now pervades our entomological works, and the species alluded to have been excluded from the present list.

It is long since Marsham expressed his regret at being imperfectly acquainted with the entomology of the northern parts of the island; and but little has been done since his time to supply the deficiency. In the earlier works that profess to treat of the insects of Great Britain, the reference to Scotland is scarcely more than nominal. The *Entomologia Britannica*, for instance, of the author just alluded to, gives the locality of only one Scotch insect; and there is no work prior, or for many years subsequent to his, more satisfactory in this respect. It is true that a good deal has of late been done by the few Scottish Naturalists who have devoted their attention to this branch of Zoology. Some additions to our knowledge have likewise resulted from the exertions of some of the English entomologists; but the opportunities which they have enjoyed of pursuing their researches in this part of the country, have not been sufficiently favourable to enable them to do more than illustrate the distribution of some of the rarer species, and supply a few desiderata in their own collections. No attempt has been made, except the imperfect one previously mentioned, to enumerate the insects of any particular district, much less to furnish a general view of those native to the country. Indeed materials are awanting for the execution of such a task, and much time and labour must be devoted to the collection and examination of species, before we can expect to see the *Fauna Scotica* in this respect make even an approach to completeness.

This is perhaps the only instance of a branch of natural science, which has long been a favourite subject of study in England and on the Continent, failing to attract any considerable share of attention in Scotland. Much of this neglect is to be ascribed to the difficulty that has hitherto existed in the determination of species, owing to the scarcity and high price of entomological works, and the want of an authentically named collection of British insects, which would create an interest in the science, and facilitate its accurate attainment. But from whatever causes it may arise, it cannot but be a matter of regret, that such an interesting field as this country presents for such pursuits should remain in a great measure unexplored. It is exceedingly well adapted, by its physical character, to repay the labours of the collector. The diversified nature of its surface in regard to soil, vegetation, and temperature, affords their appropriate places of resort to species of very dissimilar habits. The southern division of the country, approximating in the character of its geology and botany to the northern portion of England, may be expected to furnish us with most of the insects that occur in that quarter. The alpine lands of the north will present a characteristic race of their own; for the differences in the known productions of these regions from those of other parts of the country, warrant us to expect a corresponding peculiarity in their entomology. It is probable that they will produce a considerable number of the kinds that occur in the same latitudes on the adjacent continent, particularly in Norway and Sweden. The indigenous insects of these countries are well known to us, by the elaborate works of Paykull, Gyllenhal, and Schönherr; and it would be interesting to ascertain how far they are identical with the productions of our own island, and what effects their insular location has had on the latter. A careful examination of Scotland, therefore, is likely to afford some important accessions to our native Zoology; and it would, at all events, supply materials to illustrate the imperfectly known, but highly interesting subject, of the distribution of animal life over the earth's surface.

We cannot acquiesce in the opinion of Mr Stewart, that the neighbourhood of Edinburgh may be regarded as unproductive in this tribe of animals. On the contrary, it is as well adapted, by local circumstances, to the purposes of the entomologist, as most other portions of the country. Its varied scenery, which renders it so rich in vegetable productions, is equally instrumental in giving variety to its insects. The shores of the Firth of Forth supply a number of maritime species, peculiar to such situations. The Pentland Hills, attaining even in their nearer range to an elevation of 1616 feet, produce the kinds which frequent moorland and elevated heaths; while there is a sufficient frequency of lochs and other collections of water over the face of the country, for such as are aquatic. Perhaps the most unfavourable circumstance, is the deficiency of wood in the immediate vicinity of the town; and although this objection is not equally applicable to some other parts of the district, particularly Dalkeith and Rosslyn, yet these places have not hitherto furnished any considerable number of the kinds confined to such haunts. It will accordingly be perceived, that the Cerambycidæ, Lepturidæ, and some other insects whose habitat is chiefly in woods, are not proportionate in number to most of the other families. It is probable, however, that not very many of these insects are to be found in Scotland. Even some of the finest species admitted into the English Fauna, are not original inhabitants of Britain, but have been accidentally imported from other countries, and in process of time naturalised. Their proper geographical position is in the countries adjoining the equator, and they consequently diminish in number in proportion to the distance from thence. Scotland is considerably to the north of the limit where they cease to be common, and presents no local peculiarities favourable to their increase *.

As it is not only interesting but important to connect the characteristic or prevailing features of animal life with the peculiarities of climate, and as a general knowledge of the relations which exist between the dominating species and the physical characters of a country can only be collected by degrees, I think it advisable to state the following particulars regarding the climate of Edinburgh, which I have received from Mr Adie, well known for the skill and accuracy of his meteorological observations. The average temperature throughout the year, as deduced from a register

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* In addition to the few aboriginal native species which have been noticed near Edinburgh, the following have been taken in Dumfriesshire by the Rev. W. Little:—Rhagium Indagator, Saperda scalaris, Leptura quadrifasciata, Leptura lævis.

kept at Canaan Cottage (about half a mile from the south-western suburb of Edinburgh) for ten years, from January 1821 to January 1831, is 47·25°. The instruments employed in making the observations are 300 feet above the level of the high water-mark at Leith. The average of the minimum thermometer for ten years, is 15°; and the average of the maximum thermometer for the same period, is 79·5°; making the average range of the thermometer during that time 64·5°. The greatest cold which occurred during these ten years was in 1826, when, on the 16th of January, the thermometer stood at 10°. The greatest heat which occurred during that period was likewise observable in the course of the same year, the thermometer, on the 24th and 25th days of June, standing so high as 87° in the shade. Thus the range of the thermometer in 1826 amounted to 77°, which is the maximum for the time during which the register has been kept. The average quantity of rain for one year, as deduced from registers likewise kept at Canaan Cottage for nine years, is 26·922 inches.

The references to localities, it will readily be perceived, cannot easily be rendered precise and satisfactory. The haunts of such as are somewhat stationary, may be indicated with sufficient accuracy; but many insects are of such wandering habits, that they may not be found twice in the same place. Instances of the former sort occur in several of the herbivorous coleoptera, which confine themselves to one species of plant, and will not desert it for another even of the same natural genus. The coprophagous beetles, on the contrary, and those which feed on dead animals, (denominated saprophagous by Mr Macleay) are not limited to a particular place, but occur wherever their food happens to be deposited. In such cases less advantage results from local references, as the appearance of an insect in the place cited may have been accidental, and incapable of affording any great probability of its recurrence; yet even the saprophagous beetles are partly regulated by temperature and elevation, and it is likely that a dead body by the sea-shore will exhibit different species of Silphidæ, from a similar nidus exposed on a mountain summit. But the habitats of the kinds whose stations are more definite, are likewise undergoing perpetual change, from the daily increasing cultivation of the country, and consequent extirpation of the plants on which they feed. An instance of this taking place near Edinburgh is given by the late Dr Walker, who informs us that the *Cimex juniperinus* Linn, was once common at Juniper Green, so called from the shrub of that name, which formerly grew in that quarter in the utmost profusion; but that since the fields were laid under cultivation, the insect has almost entirely disappeared.

As connected with this subject, it may be proper to mention, that the appearance of insects, owing to causes for which, in most instances, it is difficult to account, is often periodical; and certain species may therefore be marked as common, in consequence of their having been so in some seasons, while in others they may happen to be scarce, or may even have disappeared altogether.

The nomenclature and arrangement adopted in the present list, are those of Mr Stephen's Systematic Catalogue of British Insects. The names have been taken from authentic specimens, and may be relied on as being those applied to the respective species by the authors whose names they bear. Such of them as were at all doubtful, have been submitted, through the attention of J. G. Children, Esq., to the examination of an accurate entomologist, Mr James Gray, of the British Museum, by whom they were carefully compared with the specimens in that collection, as well as with those in the cabinet of Mr Stephens. The last named gentleman, the well-known author of the *Illus-*

trations of British Entomology, also lent his aid in the investigation, and has kindly drawn up descriptions of the new species.

I cannot conclude without acknowledging the obligations I owe to Professor JAMESON, for the facilities of access which he has afforded me, with his usual zeal for the advancement of Natural History, to such means of information as are attainable in this part of the country. Sir PATRICK WALKER has furnished me with a variety of scarce insects, the result of several years assiduous collecting in the neighbourhood of Edinburgh. I am indebted in a more particular manner to JAMES WILSON, Esq., whose assistance I cannot appreciate too highly, from his extensive acquaintance with the subject, nor acknowledge too gratefully, for the kindness and liberality with which it has been bestowed.

ORD. COLEOPTERA. SECT. ADEPHAGA.

SUB-SECT.—GEODEPHAGA.

FAMILY CICINDELIDÆ.

Genus CICINDELA.

C. campestris, *Linn. Don. Marsh.*

This insect has not been observed in the immediate vicinity of Edinburgh, but it occurs on the Pentland Hills and at Rosslyn. It is by no means a scarce species either in the southern or western parts of Scotland. May—July.

FAM. BRACHINIDÆ.

Gen. DRYPTA.

D. emarginata, *Fab.* *Car. chrysostomos*, Marsh.

Beneath marine rejectamenta at Leith sands. Rev. F. W. HOPE. Steph. Illus. pl. 1. f. 2.

Gen. DROMIUS.

D. agilis, *De Jean.* *Steph.* *Car. agilis*, Fab.

Not common in the Edinburgh district. Near Cramond House. Miss HOPE JOHNSTONE of Annandale.

D. quadrimaculatus, *De Jean.* *Steph.* *Car. 4-maculatus*, Linn. Marsh.

Frequent beneath the bark of trees in winter, but not met with very plentifully in the summer. Cramond. Rosslyn. Corstorphine.

D. fasciatus, *De Jean.* *Steph.* *Car. fasciatus*, Fab.

Plentiful in various places, especially under stones at Salisbury Craigs. Braid Hill. Sea-shore at Caroline Park. March—September.

D. linearis, *De Jean.* *Steph.* *Car. linearis*, Oliv. Marsh.

Not uncommon. Salisbury Craigs, occasionally under stones. Figget Whins, frequent. March—July.

D. foveolus, *Steph.* *Dr. punctatellus*, De Jean.

Frequent on dry elevated places. Arthur's Seat. Craiglockhart. Braid Hills. April—July.

Gen. LAMPRIAS.

L. chlorocephalus, *Samou.* *Steph.* *Car. cyanocephalus*, Marsh. Don.

Not very common. Under stones on dry banks by the side of Braid Burn. Bell's Mills. It is said to frequent the broom. April—July.

FAM. SCARITIDÆ.

Gen. CLIVINA.

C. Fossor, *Leach. Steph. Car. distans,* Marsh. *Cliv. arenaria,* Latr.

Under stones in moist sandy places; plentiful in the spring months. Field opposite the Clinkstone quarry in Blackford Hill, very abundant at times. King's Park. Pentland Hills, &c. It is probable that the other British species, *C. collaris,* may occur in this neighbourhood, as it is occasionally found in the more southern counties of Scotland, and seems to be pretty generally, though sparingly, distributed.

Gen. DYSCHIRIUS.

D. æneus, *Steph. Cliv. ænea,* De Jean.

Not common. Sandstone quarry on the shore at Joppa. July.

D. gibbus, *Steph. Car. remotus,* Marsh.

Not very common. Moist sandy spots among the Pentland Hills. Marshy ground on the west side of Arthur's Seat.

FAM. CARABIDÆ.

Gen. CYCHRUS.

C. rostratus, *Fab. Leach. Ten. rostratus,* Linn. *Car. rostratus,* Marsh. Don.

This insect, not unfrequent throughout Scotland, occurs in considerable abundance in this neighbourhood. When taken it often emits a sharp sound, by the friction of the posterior segments of the abdomen against the apex of the elytra. The property of ejecting a fluid substance, common to the family, is sometimes very distinctly shown by this species. The fluid is extremely acrid, but as it does not volatilize rapidly, it fails to produce those effects that are so remarkable in the case of the Brachini. Salisbury Craigs and Arthur's Seat. Braid Wood. Pentland Hills. Feb.—June.

Gen. Carabus.

C. catenulatus, *Fab.* *Leach.* *Car. intricatus*, Marsh.

The most common species of the genus, as now restricted, not only in this neighbourhood, but throughout the southern district of Scotland. It is evidently the insect that Mr Stewart mistook for the *C. purpurascens*, Fab., which is not a native of this country. Salisbury Craigs. In fields and woods round Edinburgh, frequent. March —August.

C. monilis, *Fab.* *Steph.* *Car. catenulatus*, Linn. Marsh.

Rare. It has been taken near Coates, immediately to the west of the New Town.

C. cancellatus, *Fab.* *Steph.* *Car. granulatus*, Linn. Don. Marsh. *Car. morbillosus*, Leach. Samou.

Not very common. It has been taken on the shore near Cramond, at Rosslyn, on Corstorphine Hill, and under stones on the top of the wall by the side of the road leading from Craigleith Quarry to the sea. March—August.

C. arvensis, *Fab.* *Leach.* *Steph.*

The only locality in the neighbourhood for this species, is the Pentland Hills. It occurs but sparingly in the months of May, June, and July.

C. violaceus, *Linn.* *Don.* *Marsh.*

Not very plentiful. In fields and woods, occasional.

Pentland Hills. Portobello. Salisbury Craigs. Banks of the Water-of-Leith, above Coltbridge.

C. hortensis, *Fab.* *Marsh.* *Car. nemoralis*, Illig. Stew. Samou. *Car. gemmatus*, Don.

Nearly as common as *C. catenulatus*, occurring in gardens, pathways, &c., in the spring and summer. Salisbury Craigs. Duddingston. Corstorphine Hill, &c. &c.

C. nitens, *Linn.* *Don.* *Marsh.*

This beautiful species was not many years ago accounted rare, but it has of late been met with in tolerable abundance on heaths in the north of England, and south of Scotland. It likewise occurs near Dunkeld. The Pentland Hills are its nearest Edinburgh locality. James Wilson, Esq.

Carabus glabratus, which is not a very rare insect in the mountainous districts of Scotland, has been taken on the Pentland range, but at too great a distance to admit of its insertion as an inhabitant of the Edinburgh district.

Gen. HELOBIA.

H. brevicollis, *Curtis.* *Steph.* *Car. rugimarginatus*, Marsh.

Common almost everywhere beneath stones, and may be found throughout the greater part of the year.

H. Gyllenhalii, *Curtis*, iii. pl. 103. *Car. Gyllenhalii*, Schön.

First ascertained to be a native of Scotland by the late R. Rawlins, Esq., who met with it near Edinburgh. It occurs, in considerable abundance, by the side of the Esk at the new bridge in the line of the Railway; and more sparingly on the banks of the Water-of-Leith. March—June.

Gen. LEISTUS.

L. fulvibarbis, *De Jean*. *Curtis*, iv. pl. 176.

Discovered near Edinburgh by Mr RAWLINS. It is found occasionally in various parts of the country, but no where in great plenty. Cramond. Banks of the Esk near Dalkeith. May—August.

L. rufescens, *Steph*. *Car. rufescens*, Fab. Marsh.

Of not unfrequent occurrence beneath stones in mossy places, at the roots of trees, &c. Braid Wood. Braid Hill. Craiglockhart. May—July.

FAM. HARPALIDÆ.

Gen. LORICERA.

L. pilicornis, *Steph*. *Lor. ænea*, Latr. *Car. pilicornis*, Fab. Marsh. Don.

Very common under stones in summer. Hybernates in the decaying roots of trees, and among moss. Salisbury Craigs. Duddingston. Road sides round Edinburgh. Corstorphine Hill in decaying wood ; very plentiful in September and October.

Gen. BADISTER.

B. bipustulatus, *Clairv*. *Leach*. *Car. bipustulatus*, Fab. Marsh. Don.

Under stones, not unfrequent. King's Park. Road sides east of Portobello, &c. April—June.

Gen. CHLÆNIUS.

C. nigricornis, *Curtis*. *Steph*. *Car. nigricornis*, Marsh.

Not very common. Margin of Duddingston Loch. April—August.

C. vestitus, *Curtis. Steph. Car. vestitus,* Marsh. *Car. marginatus,* Linn.

Not common. It has been taken on the banks of the Water-of-Leith. April—June.

Gen. Anchomenus.

A. prasinus, *Steph. Car. viridanus,* Fab. Marsh.

Not unfrequent. It seems to be most plentiful under stones in a stiff clayey soil. Duddingston, and road sides east of Duddingston. Fields round Edinburgh. March—October.

A. albipes, *Steph. Car. circulatus* and *Car. dilutus,* Marsh.

Frequent under stones in moist sandy situations, by the sides of rivers. Water-of-Leith, Esk, &c.

Var. β. Pale ferruginous. With the other, occasional.

Gen. Sphodrus.

S. leucophthalmus, *Kirby* and *Spence. Steph. Car. leucophthalmus,* Linn. Marsh.

Not common.

Gen. Pristonychus.

P. Terricola, *De Jean. Spho. Terricola,* Steph. *Car. Terricola,* Marsh. *Car. subcyaneus,* Illig.

This insect has been taken in an outhouse at Drumsheugh. It does not appear to be common in Scotland. It occurs in damp cellars.

Gen. Agonum.

A. marginatum, *Curtis. Steph. Car. marginatus,* Linn. Marsh.

Not very scarce. Margin of Duddingston Loch. Salisbury Craigs. Portobello Sands, where it appears at times on the wing in considerable numbers.

A. sexpunctatum, *Samou.* *Steph.* *Car. sexpunctatus,* Linn. Marsh.

This splendid species has been taken several times near Edinburgh. It was found by Mr Stewart, and has occurred more recently on the banks of the Water-of-Leith, a little to the west of Edinburgh.

A. parumpunctatum, *Curtis.* *Steph.* *Car. cærulescens,* Marsh.

Frequent under stones in damp places. Duddingston. Salisbury Craigs, &c. Varieties of a blue and violet tint of colour, are frequently met with by the sides of small streams, and in marshy places, among the Pentland Hills. April—September.

A. viduum, *De Jean.* *Steph.*

In marshy places, occasional. Hunter's Bog. Pentland Hills.

A. mœstum, *Sturm.* *Steph.*

Marshy places, and by the sides of rivulets, among the Pentland Hills.

A. picipes, *Samou.* *Steph.* *Curtis.* *Car. picipes,* Fab.

This species has been taken in the neighbourhood of Edinburgh by James Wilson, Esq. It is not common.

Gen. Synuchus.

S. vivalis, *Gyllen.* *Steph.* *Car. vivalis,* Illig.

Not common in the Edinburgh district, but frequent a little to the south. Near Dalkeith.

Gen. Calathus.

C. melanocephalus, *Curtis.* *Steph.* *Car. melanocephalus,* Linn. Marsh. Don.

A very common species, occurring beneath stones, &c., almost everywhere. It may often be found hybernating under stones, in company with Helobia brevicollis, Loricera pilicornis, and Calathus Cisteloides.

C. Cisteloides, *Curtis. Steph. Car. flavipes,* Oliv. Marsh.

Equally common with the preceding. Var. β. Legs and antennæ pitchy black, not unfrequent. King's Park, &c.

C. rufangulus, *Steph. Car. rufangulus,* Marsh.

Very rare. Marshy meadow at Restalrig.

C. mollis, *Steph. Car. mollis,* Marsh.

Figget Whins; sand bank facing the sea, among the matted roots of the Arundo arenaria*, and Carex arenaria. Var. β. Pitchy red, with the legs and antennæ testaceous, likewise occurs in this situation. April—August.

Gen. ARGUTOR.

A. erythropus, *Steph. Car. erythropus,* Marsh.

Pretty frequent. King's Park, &c.

A. pullus, *Steph. Har. pullus,* Gyllen.

Not so common as the preceding.

Gen. PŒCILUS.

P. dimidiatus, *Curtis. Steph. Car. dimidiatus,* Marsh. Don.

Not common. Corstorphine. April—May.

P. cupreus, *Curtis. Steph. Car. cupreus,* Linn. Marsh. Don.

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* It is desirable that the new genus, lately introduced into British botany for the reception of this plant, should be designated by another name, as that of Ammophila is preoccupied. It was adopted by Mr Lindley and Dr Hooker from Host's "Icones et Descriptiones Graminum Austriacorum," published in 1809, but Mr Kirby had applied it to a genus of Hymenopterous insects, in a paper read to the Linnean Society in 1797.

An abundant species during spring and summer; to be found in fields, pathways, and by road sides. The colour of the upper surface is very variable; in marshy situations it is frequently almost black.

Gen. OMASEUS.

C. orinomum, *Leach.* *Steph.*

Pentland Hills, near the summit of the eastern elevation, under stones in places where the turf has been peeled. April, May.

O. Nigrita, *Curtis.* *Steph.* *Car. Nigrita*, Fab. *Car. aterrimus*, Marsh.

Under stones, and among moss in woods, not scarce. Woods at Dreghorn. Craigmillar. Corstorphine, &c.

O. melanarius, *Nicol.* *Steph.* *Car. leucophthalmus*, Fab. *Car. angustior*, Marsh.

Pretty frequent under stones in fields and woods. King's Park. Near Leith. Slateford. Restalrig. Craigleith, &c. March—September.

Gen. STEROPUS.

S. madidus, *De Jean.* *Steph.* *Car. madidus*, Fab. Marsh.

One of the most abundant of the Harpalidæ. It occurs everywhere beneath stones, at the roots of trees, &c In some seasons it is particularly plentiful in the autumn.

Var. β. Legs rufous. Common, and found in company with the other. The only other British species of this genus, Ster. Æthiops, Panz., Ster. concinnus, Curtis, has been captured in Scotland.

Gen. BROSCUS.

B. cephalotes, *Panz.* *Steph.* *Car. cephalotes*, Linn. Marsh. Don.

Plentiful under stones, and marine rejectamenta, on the shore between Portobello and Musselburgh ; also between Newhaven and Cramond. The attitude this insect assumes when touched is peculiar. The anterior legs are brought close together, and extended downward, at right angles with the under surface of the body. The hind legs are bent upwards, and project in a similar way from the opposite surface. The antennæ are drawn close to the sides of the thorax, and the mandibles extended to their utmost stretch, while a considerable degree of rigidity is imparted to the whole. It takes this posture most readily in cold weather; at other times, when more active, it prefers seeking safety by flight, or by burrowing in the sand. A somewhat similar appearance has been observed in Clivina Fossor, to which the present insect is much more closely related, than to the species with which it is usually associated in systematic arrangements.

Gen. Stomis.

S. pumicatus, *Clairv.* *Steph.* *Car. tenuis*, Marsh.

Not frequent. Banks of the Water-of-Leith, and elsewhere. April—June.

Gen. Patrobus.

P. rufipes, *De Jean.* *Steph.* *Car. rufipes*, Fab.

Apparently a littoral insect. Near Edinburgh. Steph. Illus. vol. i. Banks of the Esk, near Dalkeith. It is a common insect in some parts of Roxburghshire. June—August.

Gen. Abax.

A. striola, *Steph.* *Car. striola*, Fab. *Car. depressus*, Marsh.

This insect has been taken occasionally in this neighbourhood, but it is rather scarce.

Gen. AMARA.

A. lata, *Sturm.*

Not very scarce; under stones in sandy places. Salisbury Craigs. Sandy banks near Canonmills. Fields near Craigleith Quarry, &c. April—August.

A. similata, *Sturm. Steph. Har. similatus,* Gyllen.

Not so common as the last, but found occasionally at the base of Blackford Hill, and in other situations.

A. trivialis, *Nicol. Steph.*

Very common on Arthur's Seat, Braid Hills, Craiglockhart, &c. April—August.

A. communis, *Panz. Steph. Car. communis,* Fab. Marsh.

A very common insect, occurring almost everywhere. Under stones on Fisherrow Links, in the utmost profusion. March—October.

A. familiaris, *Creutz. Nicol. Steph.*

Also frequent.

A. tibialis, *De Jean. Steph. Car. tibialis,* Payk.

Occasional.

Gen. BRADYTUS.

B. consularis, *Steph. Am. consularis,* Sturm.

In warm sandy places under stones, occasional. Road sides east of Leith. Figget Whins. Salisbury Craigs, &c.

B. apricarius, *Steph. Car. apricarius,* Fab. *Car. par,* Marsh.

In such places as the preceding, but rather more frequent. Salisbury Craigs. South side of Arthur's Seat. Braid and Blackford Hills, &c.

B. ferrugineus, *Steph. Car. ferrugineus,* Linn. Marsh.

This species appears to be confined to the sea-shore, where it may be found at times under stones. Fisherrow. Granton.

Gen. Curtonotus.

C. aulicus, *Steph.* *Car. aulicus,* Illig. *Car. convexus,* Marsh.

Not a scarce insect; usually found under stones. Salisbury Craigs. By the side of the Railway east of Duddingston. Cramond.

Gen. Harpalus.

H. punctiger, *Steph.*

Not very frequent. South-east side of Arthur's Seat, near Duddingston.

H. limbatus, *Sturm.* *Steph.*

This species occurs at times under stones.

Var. β, with the body beneath ferruginous, is occasionally found at Salisbury Craigs: this character, however, is not permanent, but arises from the specimen being immature.

H. æneus, *Gyllen.* *Steph.* *Car. æneus,* Fab. Marsh. *Car. discolor* and *Car. azureus,* Marsh. *Car. Proteus,* Payk.

In sandy places, under stones, most abundant. Salisbury Craigs. Along the sea-coast from Leith to Musselburgh, &c. This is a very variable insect, and there can be little doubt that some of its varieties have been regarded as distinct species. It is sometimes found in this neighbourhood with the legs and antennæ pitchy black, in which state it is the *Har. confinis.* The conjecture of Mr Stephens, that the latter does not differ specifically, is confirmed by the occurrence of intermediate varieties, which render in impossible to draw a line of distinction.

H. ruficornis, *Gyllen.* *Sturm.* *Steph.* *Car. ruficornis,* Fab. Marsh.

Very plentiful. By the side of the Railway east of

Duddingston. King's Park, and places in the neighbourhood. Waste places round Edinburgh. April—August.

Gen. Ophonus.

O. puncticollis, *De Jean.* *Steph.*
Near Edinburgh. Steph. Illus.

O. foraminulosus, *Steph.* *Car. foraminulosus*, Marsh.
Calton Hill, Edinburgh. Dr Leach.

O. cribellum, *Leach.* *Steph.* *Oph. brevicollis*, De Jean.
Under stones, seemingly not common.

Gen. Trechus.

T. dorsalis, *De Jean.* *Car. dorsalis*, Fab. Steph. Illus. pl. ix. f. 4.

This species is said to occur most commonly in spring, at the roots of grass, and on gravelly banks by the sides of ponds. In this neighbourhood it inhabits the Pentland Hills, in some situations in considerable numbers.

T. parvulus, *Sturm.* *Stenolophus parvulus*, Steph. Catal.
Under stones in damp places, not rare. It is a scarce insect near London, and in some other parts of England.

T. fulvus, *Samou.* *Steph.* *Car. fulvus*, Marsh.
Common under stones in fields and road sides. Road sides at Duddingston, Craigmillar, Libberton, &c. Fields near Corstorphine. March—August.

Fam. BEMBIDIIDÆ.

Gen. Cillenum.

C. laterale, *Leach.* *Curtis*, v. pl. 200.

This insect was first discovered by Dr Leach on the sea-shore near Portobello, and has been taken since in considerable plenty on the coast of Norfolk. It was formerly pretty frequent in the first mentioned locality, but of late years it has become very scarce. According to Mr CURTIS, the spines with which the anterior legs of many predacious insects are furnished, exhibit a peculiar arrangement in this species, for the purpose of enabling it to secure more effectually the object on which it feeds.

Gen. TACHYS.

T. immunis, *Steph.*

Not unfrequent in dry sandy places, in spring.

Gen. PHILOCHTHUS.

P. biguttatus, *Steph.*

Under stones in fields, occasional. Fields west of Corstorphine Hill, on the Queensferry road. Fields near Craiglockhart.

P. subfenestratus, *Steph.*

Not very common.

Gen. PERYPHUS.

P. littoralis, *Steph.* *Car. littoralis*, Oliv. Marsh.

Very common on the shores of the Firth, and throughout the country by the sides of rivers, ponds, &c. Spring and summer.

P. decorus, *De Jean.* *Car. immunis*, Marsh.

Not common. Under sea-weed on the shore east of Portobello.

P. agilis, *Steph.* *Per. fuscicornis*, De Jean.

Occasional, under stones chiefly in sandy places. Banks of the Water of Leith, and Esk.

P. tibialis, *Steph.*

Sandy places, not common. Sand-pit beside the Experimental Garden.

Gen. Notaphus.

N. ustulatus, *De Jean.* *Steph.* *Car. ustulatus,* Linn. Stewart's list, Wern. Mem. vol. i.

Gen. Lopha.

L. quadriguttata, *De Jean.* *Steph.* *Car. 4–guttatus,* Fab. Marsh.

A scarce insect in this neighbourhood. It occurs in a marshy spot on the banks of the Canal, at the Bridge No. 8.; and in a similar situation a little to the west of the lodge at Penycuik House.

Gen. Tachypus.

T. celer, *Steph.* *Car. celer,* Fab. *Car. rufipes,* Oliv.

Frequent on sand-banks, pathways, &c., during spring and summer.

T. striatus, *Steph.*

" A common species in the northern counties of England, and the southern parts of Scotland, but does not occur in the south of England. Canonmills, Edinburgh." Steph. Illus.

Fam. ELAPHRIDÆ.

Gen. Notiophilus.

N. aquaticus, *Leach.* *Steph.* *Cic. aquatica,* Linn. Marsh.

Not so common as the following, but far from scarce, in sandy fields round Edinburgh. King's Park. Calton Hill.

Var. β of Paykull, with little of the æneous lustre, has been taken near Portobello, by Dr Leach.

N. biguttatus, *Leach. Steph. Elaph. biguttatus,* Fab. *Cic. biguttata,* Marsh.

A plentiful species, occurring in sandy fields, gavel pits, &c.

Gen. Elaphrus.

E. uliginosus, *Fab. Curtis,* iv. pl. 179. *Cic. uliginosa,* Marsh.

"Banks of wet ditches on the borders of the Links, near Edinburgh." Dr Leach, Edin. Ency.

E. cupreus, *Curtis. Steph.*

"Found on the borders of lakes and ponds, from April to August. It runs upon the mud, when the sun shines, with great rapidity, and is difficult to capture." Curtis. Margin of Duddingston Loch. Lochend, &c.

E. riparius, *Fab. Leach. Cic. riparia,* Linn. Marsh. Don.

In such situations as the last, but not quite so frequent. Sea-shore between Leith and Portobello, on the moist sand, plentiful. April—August.

Sub.-Sect. HYDRADEPHAGA.

Fam. DYTICIDÆ.

Gen. Haliplus.

H. ferrugineus, *Gyllen. Steph. Dytis. ferrugineus,* Linn. Braid Hill marshes. Ditches at Muttonhole, &c. April—June.

H. lineato-collis, *Gyllen. Steph. Dytis. lineato-collis,* Marsh.

A common inhabitant of the ponds in the neighbourhood, during the spring months. It may sometimes be taken in considerable numbers in company with Hydropori, adhering to the under side of floating leaves, wood, &c. March —July.

H. ruficollis, *Samou.* *Steph.* *Dytis. ruficollis*, Marsh.

Not so common as the preceding, but not of rare occurrence. Braid Hill marshes. Duddingston Loch.

Gen. PAELOBIUS.

P. Hermanni, *Leach.* *Dytis. Hermanni*, Marsh.

Very scarce. Pond at Coates, Sir P. WALKER. It has been conjectured that this insect did not occur so far to the north. It is certainly very scarce in Scotland; but it may be remarked regarding the distribution of aquatic insects generally, that there is every reason to believe their range to be very extensive. This is no doubt owing, in a great measure, to the equable temperature of the medium in which they live, which exempts them so far from the modifying influence of climate; a fact of which we have a familiar illustration in many of the common Dyticidæ continuing active throughout the winter, when the cold has made other insects torpid. The Dyticus marginalis is common in Greenland, and it is dispersed over all Europe. According to LATREILLE, the Dyticus griseus, which is found in Provence, Piedmont, and other countries adjacent to the Mediterranean, occurs also in Bengal *. These considerations render it not improbable that many of the aquatic insects, which, as British, have hitherto been regarded as confined to the southern parts of the island, may yet be added to our Scotch lists. The desideratum most desirable to be supplied, is the Hydrous piceus, one of the largest native insects. It is common near London, and has been found as far north as Newcastle.

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* See his "Introduction à la Géographie Générale des Arachnides et des Insectes," originally published in the third volume of the "Mémoires du Muséum d'Histoire Naturelle."

Gen. Hyphidrus.

H. ovatus, *Samou.* *Dytis. ovatus,* Linn. Marsh.

Not common, but has been occasionally met with in the lochs and ponds around Edinburgh. Pond, Coates. Lochend. Mr Stephens conceives the H. ovalis, Fab., to be the female of this species.

Gen. Hygrotus.

H. reticulatus, *Steph.* *Dytis. reticulatus,* Fab.

Very plentiful, in company with Halipli and Hydropori. Pond, Botanic Garden. Ditches at the west end of Duddingston Loch, &c. &c.

Gen. Hydroporus.

H. depressus, *Kunzé.* *Dytis. elegans,* Illig. Marsh.

This insect occurs in shallow pools by the side of the Esk, near Dalkeith, in the month of August.

H. duodecim-punctatus, *Samou.* *Steph.* *Dytis.* 12–*punctatus,* Fab. Marsh.

Near Edinburgh. Sir P. Walker. It is not common.

H. trivialis, *Spence.* *Steph.*

With the other species, rare.

H. melanocephalus, *Samou.* *Steph.* *Dytis. melanocephalus,* Marsh.

In shallow pools, seemingly not very common. Ditches near Craigcrook.

H. erythrocephalus, *De Jean.* *Steph.* *Dytis. erythrocephalus,* Linn.

An extremely common insect, occurring in every collection of water round Edinburgh, and may be found throughout the year.

H. flavipes, *Samou.* *Dytis. flavipes*, Fab. *Dytis. humeralis*, Marsh.

Pretty frequent in stagnant waters. Pond, Botanic Garden. Ditches at Duddingston, &c.

H. holosericeus, *Steph.* *Dytis. holosericeus*, Marsh.

Not very plentiful, but may be found with the preceding occasionally.

H. pubescens, *Steph.*

Frequent in Braid marshes, and other places.

Gen. Laccophilus.

L. minutus, *Leach.* *Dytis. minutus*, Linn. Marsh.

Ponds and ditches, occasional. Pond at Coates, and elsewhere.

Gen. Colymbetes.

C. guttatus, *De Jean.* *Steph.* *Dytis. picinus.* Marsh.

In shallow ditches, not very frequent. Ditches at Craigcrook. Braid marshes, &c.

C. fontinalis, *Leach.* *Steph.*

Not common. Ditches in the Meadows.

C. fuliginosus, *Samou.* *Steph.* *Dytis. uliginosus*, Marsh.

Not very common. It is usually found in shallow pools with a muddy bottom, having the surface overrun with grass and aquatic plants.

C. striatus, *Steph.* *Dytis. striatus*, Linn. Marsh.

A common species, and resembles *C. fuscus* so closely that it can with difficulty be distinguished. The latter is local in its distribution, and does not appear to inhabit this neighbourhood. Duddingston Loch. Muttonhole. Ditches in the Meadows, &c.

C. exsoletus, *Forst.* *Col. collaris*, Steph. Catal.

Not common; Lochend.

C. bipunctatus, *Samou.* *Dytis. bipunctatus*, Marsh. Don: *Col. nebulosus*, Steph. Illus.

This beautiful species is not unfrequent. Like its congeners it may be found during the greater part of the year, but it seems to be most plentiful in the spring. Braid Hill marshes. Ditches near Craigcrook. Marshy spot in the King's Park, near the Powder Magazine.

C. Sturmii, *De Jean.* *Dytis. Sturmii*, Gyllen.

Ditches in the Meadows. West end of Duddingston Loch.

C. maculatus, *Steph.* *Dytis. maculatus*, Linn. Marsh.

Ponds and rivers, but not very common. Esk, at the new bridge in the line of the railway. It was exceedingly abundant in this situation last May, not only in the river, but at the roots of the plants growing on its banks.

C. chalconotus, *Steph.* *Dytis. concinnus*, Marsh.

Braid marshes.

C. uliginosus, *Steph.* *Dytis. uliginosus*, Linn. *Dytis. Hybneri*, Marsh.

Not a common species.

C. bipustulatus, *Leach.* *Steph.* *Dytis. bipustulatus*, Linn. Marsh.

Extremely plentiful throughout the greater part of the year.

C. fenestratus, *Samou.* *Steph.* *Dytis. fenestratus*, Fab. Marsh.

Ditches at the west end of Braid Hill.

C. obscurus, *Samou.* *Steph.* *Dytis. obscurus*, Marsh.

Marshes at Currie, and in collections of water among the Pentland Hills.

Gen. Dyticus.

D. circumflexus, *Illig.* *Leach.* *Steph.* *Samou.* pl. 3. f. 13.

In ponds and ditches, not common.

D. marginalis, *Linn.* *Marsh.* *Don.*

Not nearly so common as in the more southern parts of Scotland, and in England. Muttonhole.

D. punctulatus, *Illig.* *Marsh.* *Don.*

This appears to be more plentiful than either of the preceding species, not only in this neighbourhood, but in other parts of the country. Duddingston Loch. Braid Hill marshes. Lochend.

Gen. Acilius.

A. sulcatus, *Samou.* *Dytis. sulcatus,* Linn. *Dytis. cinereus,* Marsh.

Extremely common in every piece of stagnant water. Braid Hill marshes. Duddingston Loch. Lochend, &c. Throughout the year.

A. canaliculatus, *Steph.* *Acil. caliginosus,* Curtis, vol. ii. pl. 63.

Near Edinburgh. Mr Bainbridge. Steph. Illus. vol. ii. p. 94.

Fam. GYRINIDÆ.

Gen. Gyrinus.

G. æneus, *Leach.* *Steph.*

Duddingston Loch. Dr Leach. Steph. Illus.

G. marinus, *Gyllen.* *Steph.*

Lochend. Dr Leach. Steph. Illus.

G. natator, *Linn.* *Marsh.* *Samou.*

Abundant in stagnant waters. Duddingston Loch. Lochend, &c. &c.

SEC. RYPOPHAGA.

SUB.-SEC. PHILHYDRIDA.

FAM. PARNIDÆ.

Gen. PARNUS.

P. auriculatus, *Illig.* *Curtis.* *Steph.*

Pentland Hills, under stones, early in March. Marshy places at the west end of Duddingston Loch. June.

FAM. LIMNIIDÆ.

Gen. ELMIS.

E. Volkmari, *Latr.* *Chry. buprestoides*, Marsh. Curtis. Brit. Ent. vii. pl. 294.

Banks of the Almond, not far from the mouth of the river. July.—Another species of the genus was taken at the same time, by the side of a mill-stream a little higher up the river, but it was accidentally destroyed before its specific characters had been ascertained.

Gen. ENICOCERUS.

E. viridiæneus, *Steph.* *Curtis*, vii. pl. 291.

The curious and somewhat anomalous insect on which this genus was formed, was discovered by Mr GIBSON, at Hebden Bridge, Yorkshire, in October 1828. It is figured and described by Mr STEPHENS, in the appendix to the second volume of his Illustrations, and more recently by Mr CURTIS, in the seventh volume of his British Entomology. The characters of no less than two additional species are given by Mr CURTIS, from specimens transmitted to him from the above-mentioned locality. The specific distinctions are made to rest chiefly on the degree of convexity in the thorax, and the number and form of the foveolets on its surface. But it is apparent that, in these respects, the insect is liable to considerable variation. In some specimens the anterior foveolet is obsolete; and, if this circumstance is to be regarded as indicating nothing more than a casual variety, it seems improper to make the presence of additional foveolets the diagnosis of specific difference. The diaphanous appearance of the anterior angles, and lateral margins of the thorax, in E. Gibsoni, may be sufficiently accounted for on the supposition that the specimens were immature. The comparative depression of the thorax might be owing to the same cause; and if it become elevated as the insect advances to maturity, the probable effect of this will be to obliterate more or less the anterior foveolets, and by causing the margins of the ovoidal foveæ at the base to approximate, give them the narrow and elongated form characteristic of the typical species. In one of the two examples of E. viridiæneus, which occurred in this neighbourhood, there were three distinct impressions on the anterior margin, and a fourth scarcely visible; in this respect exactly intermediate between E. Gibsoni, and the usual appearance of E. viridiæneus.—On floating leaves in the pond of the Botanic Garden. May.

FAM. HELOPHORIDÆ.

Gen. HYDROCHUS.

H. elongatus, *Steph.* *Hydroph. cicindeloides*, Marsh.

Not common. It occurs in a piece of stagnant water near the farm-house, on the north side of Braid Hills, in the month of May.

H. brevis, *Steph.*

A few specimens of this scarce insect were taken last summer by Mr JAMES STARK, in the ditches near Craigcrook. It likewise occurs in Dumfries-shire.

Gen. HELOPHORUS.

H. aquaticus, *Steph.* *Silpha aquatica*, Linn. *Hydroph. stagnalis*, Marsh.

The most common insect of the family, abounding in every pond and ditch throughout the country. Water-of-Leith, to the west of Edinburgh, where it has been observed on the wing as early as the middle of March.

H. granularis, *Steph.*

Frequent in ponds and marshy places. Braid Hill marshes. Duddingston, &c.

H. griseus, *Samou.* *Steph.* *Hydroph. affinis*, Marsh.

With the others, not rare.

H. fennicus, *Samou.* *Steph.* *Hydroph. cinereus*, Marsh.

In marshes, occasional. Braid Hill marshes. Pentland Hills.

H. nubilus, *Samou.* *Steph.* *Hydroph. nubilus*, Marsh.

Frequent in marshes. Braid marshes, &c.

FAM. HYDROPHILIDÆ.

Gen. LIMNEBIUS.

L. truncatellus, *Steph.*

Not unfrequent in shallow stagnant water. It is usually found among the mud, or adhering to the submerged stems, and roots of plants. Braid Hill marshes. Pool in an old quarry by the side of the road to Collinton, opposite Craiglockhart. March—September.

Gen. HYDROBIUS.

H. fuscipes, *Steph.* *Dytis. fuscipes*, Linn. *Hydroph. fuscipes*, Marsh.

Ponds and ditches, common. Duddingston Loch. Braid Hill marshes, &c. April—August.

H. orbicularis, *Samou.* *Hyd. orbicularis*, Fab. Marsh.

Seemingly a scarce species. Ditches at the west end of Duddingston Loch, sparingly.

H. bipunctatus, *Steph.* *Hyd. bipunctatus*, Fabr. Marsh.

Duddingston Loch, and elsewhere, frequent. April—June.

H. striatulus, *Steph.*

I have repeatedly taken, in company with the preceding, an insect agreeing well with the description that is given of this species, but it seems to be nothing more than a variety of H. bipunctatus, and not entitled to specific distinction.

H. minutus, *Samou.* *Hyd. minutus*, Fab. Marsh.

Ditches at Duddington. Braid marshes.

FAM. SPHÆRIDIIDÆ.

Gen. CERCYON.

C. ruficorne, *Steph.*

Frequent. Shore at Portobello, April and May.

C. littorale, *Steph.* *Hyd. obscurus*, Fab.

In considerable plenty on the shore at Figget Whins, in April and May.

C. dilatatum, *Steph.*

With the preceding, not rare.

C. lævigatum, *Steph.*

Apparently one of the rarer kinds. It has been taken near Newhaven, in warm weather in April.

C. obsoletum, *Steph.* *Der. lugubris*, Marsh.

Very common on walls by the sides of highways. March —September.

C. suturale, *Steph.*

Not scarce during the spring months.

C. laterale, *Samou. Steph.* *Der. lateralis*, Marsh.

Not unfrequent on wall tops in the spring.

C. hæmorrhoidale, *Kirby*, *Steph.*

Frequent in pastures and in farm-yards. According to Mr Kirby, it is often found in the water, in consequence of which Fabricius considered it to be a Hydrophilus.

C. melanocephalum, *Samou.* *Der. melanocephalus*, Linn. Marsh.

Very plentiful in such places as the preceding, and sometimes on flowers.

C. quisquilium, *Samou.* ♂ ; *Scar. quisquilius*, Linn. *Der. quisquilius*, Marsh. ♀ ; *Coccin. unipunctata*, Linn. *Der. unipunctatus*, Marsh.

Very plentiful in spring and autumn, on wall-tops near stables, and on highways.

Gen. SPHÆRIDIUM.

S. scarabæoides, *Fab.* *Der. scarabæoides*, Linn. Marsh.

Exceedingly abundant in the autumn, in company with the Aphodiidæ.

S. marginatum, *Fab.* *Der. marginatus*, Marsh.

Rare. It has been taken only once near Edinburgh.

FAM. ANISOTOMIDÆ.

Gen. PHALACRUS.

P. corticalis, *Illig.* *Der. politus*, Marsh.

Ravelstone-wood, near Edinburgh, under the bark of firs, in winter. Dr. LEACH. STEPH. Illus.

Gen. LEIODES.

L. thoracica, *Steph.*

On wall-tops, trunks of trees, &c., not very frequent. Wood at Slateford. Cramond Bridge. August—October.

L. arenaria, *Steph. MSS.*

Subgloboso-ovata, pallidè rufo-ferruginea, capite thoraceque confertissimè punctatis, elytris sat profundè punctato-striatis, interstitiis subpunctatis, antennarum capitulo nigricanti. (Long. Corp. 1¼ lin.)

Somewhat globose-ovate, pale rufo-ferruginous, shining; head and thorax finely but thickly punctured, and very glossy; eyes black; elytra rather deeply punctato-striate, with all the interstices faintly punctured; legs pale testaceous; hinder tibiæ slightly curved; antennæ pale rufo-testaceous, with the club dusky.

Allied to L. ferruginea; from which it chiefly differs in having all the interstices between the striæ on the elytra, finely and somewhat remotely punctured; the body more globose, and the legs of a paler hue.

This new species was taken, last October, on the top of a wall near Cramond Bridge.

L. ferruginea, *Steph.*

Sand-bank by the side of the Esk, a little above Musselburgh. August.

Gen. AGATHIDIUM.

A. rufipes, *Rev. W. Little's MSS.*

Globosum, nigrum, nitidum, subtilissimè punctulatum, thoracis lateribus latè, antennis pedibusque rufis. (Long. Corp. 1$\frac{3}{8}$ lin.)

Globose, shining black, punctulate throughout; thorax convex, its lateral and anterior margins much dilated, and broadly rufous, glossy, very finely punctulated, the disk black; elytra distinctly punctured, with an anteriorly obsolete sutural stria on each; body beneath piceous; legs rufous, tarsi pale ferruginous; palpi and antennæ ferruginous, with the club of the latter dusky, excepting the tip of the apical joint.

Closely allied to A. ruficolle and A. globus, but sufficiently distinguished from them by the black disk of the thorax, and by other characters.

This new species was found last summer, near Restalrig, by Mr GEORGE LITTLE.

A. atrum, *Steph.*

Under stones and among moss, not frequent.

A. nanum, *Steph.*

Edinburgh. Dr LEACH. STEPH. Illus.

SUB.-SECT. NECROPHAGA.

FAM. SCAPHIDIDÆ.

Gen. PTOMAPHAGUS.

P. truncatus, *Illig.* *Chol. villosa*, Spence *. *Mord. silphoides*, Marsh.

Frequent on dead animals, decaying vegetables, &c.

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* There is an excellent monograph of this, and the two following genera, in the eleventh volume of the Transactions of the Linnean Society, by Mr SPENCE, the coadjutor of Mr KIRBY.

P. anisotomoides, *Steph.* *Chol. anisotomoides*, Spence.

On the flowers of the common Daffodil, and other plants, in gardens, somewhat rare. Botanic Garden. April—May.

Gen. Catops.

C. fornicatus, *Steph.* *Chol. nigricans*, Spence.

Not unfrequent in various situations. On decaying vegetable matter, Duddingston. Among moss in woods, near Dreghorn.

C. Leachii, *Steph.* *Chol. Leachii*, Spence.

Not common. A few specimens were taken near the Hunter's Tryste, in June.

Gen. Choleva.

C. angustata, *Steph.* *Chol. oblonga*, Spence. *Mord. picea*, Marsh.

Under stones in woods, and among moss at the roots of trees, frequent. Woods at Dreghorn. Corstorphine Hill, &c.

Fam. SILPHIDÆ.

Gen. Necrophorus.

N. Humator, *Fab.* *Silpha humator*, Oliv. Marsh. Don.

Pretty frequent under dead animals. Duddingston. Braid Hermitage, &c.

N. vestigator, *Illig.* *Steph.*

Seemingly more common in Scotland than either of the following species. Coates. Corstorphine.

N. Mortuorum, *Fab.* *Silpha Mortuorum*, Marsh. Don.

Not common.

N. Vespillo, *Fab.* *Silpha Vespillo*, Linn. Marsh.

Under dead animals, not very frequent. Rosslyn. Dalkeith, &c.

Gen. NECRODES.

N. littoralis, *Leach.* *Silph. littoralis*, Linn. Marsh.

Occurs occasionally on the shores of the Firth of Forth in carrion, and under sea-weed.

Gen. OICEOPTOMA.

O. thoracica, *Leach.* *Silph. thoracica*, Linn. Marsh.

On carcasses; but it is by no means common.

O. rugosa, *Leach.* *Silph. rugosa*, Linn. Marsh.

The most plentiful of the Silphidæ, abounding wherever there is decaying animal matter.

Gen. SILPHA.

S. quadripunctata, *Linn.* *Don.* *Marsh.* *Silph.* 4–*maculata*, Samou. pl. 2. f. 7.

This finely marked species has been captured a little to the south of Edinburgh, by JAMES WILSON, Esq. It is not of unfrequent occurrence in some districts of England, where it frequents the oak for the purpose of feeding on the larvæ of the Lepidoptera. It is undoubtedly very rare in Scotland.

S. obscura, *Linn.* *Don.* *Marsh.*

Rather scarce, but found occasionally in fields and woods. A variety with ferruginous elytra has occurred near Rosslyn.

S. tristis, *Illig.* *Steph.* *Silpha recta*, Marsh.

S. nigrita, *Creutz.* *Steph.*

Neither of the two preceding species appear to be common near Edinburgh, but both of them have been taken by J. Wilson, Esq. The latter is plentiful in some of the hilly districts of Scotland.

S. opaca, *Linn.* *Silpha tomentosa*, Marsh.

Not common. On pathways, and at the roots of trees. Blackford Hill. Dreghorn woods.

Gen. Phosphuga.

P. atrata, *Leach.* *Steph.* *Silpha atrata*, Linn. Marsh.

Common in woods and fields.

Var. β. With the margins of the thorax and the elytra testaceous. Occurs with the other occasionally.

Var. γ. Entirely testaceous. This variety, which is by no means owing to immaturity, occurs frequently on the Pentland Hills.

Fam. NITIDULIDÆ.

Gen. Nitidula.

N. Colon, *Fab.* *Marsh.* *Steph.* *Silpha Colon*, Linn.

On decaying animal matter, and under the bark of trees, occasional. May—July.

N. discoidea, *Fab.* *Marsh.* *Samou.* *Steph.*

In such situations as the foregoing, but much more frequent. Sea-shore. Salisbury Craigs.

N. bipustulata, *Fab.* *Marsh.* *Silpha bipustulata*, Linn.

On carcasses, frequent; and occasional on putrescent vegetables and Boleti.

N. oblonga, *Herbst.* *Steph.*

On the flowers of the Cnicus lanceolatus, Spear-thistle, sometimes plentiful.

N. depressa, *Illig.* *Steph.* *Nitid. æstiva*, Fab. Marsh.

On various plants, not rare. Under the bark of trees in winter.

N. obsoleta, *Illig.* *Marsh.* *Steph.*

On Boleti, and sometimes on phenogamous plants. Corstorphine Hill. Numerous varieties occur.

N. impressa, *Kirby.* *Steph.*

On putrescent Boleti, Polypori, &c. Duddingston wood. June.

Gen. MELIGETHES.

M. rufipes, *Steph.* *Nitid. rufipes*, Marsh.

On plants, not very common. June—August.

M. flavimanus, *Kirby.* *Nitid. æenea*, Marsh.

On the flowers of the Dandelion and other Syngeneseous plants, not very rare. May—July.

M. viridescens, *Steph.* *Nitid. viridescens*, Fab. Marsh.

Exceedingly abundant on the flowers of trees, and of herbaceous plants. On the flowers of the Sycamore-tree, about a mile above Dalkeith. On Thistles, Duddingston, &c. &c. May—August.

M. Pedicularius, *Steph.* *Silpha Pedicularia*, Linn. *Nitid. latipes*, Marsh.

Not unfrequent on plants.

Gen. CATERETES.

C. Urticæ, *Illig.* *Steph.* *Silpha pulicaria*, Linn.

On the plant from which it derives its specific name, but not common.

Gen. MICROPEPLUS.

M. porcatus, *Latr.* *Steph.* *Nitid. porcata*, Marsh.

Not very common; among grass and moss occasional. Blackford Hill. Craiglockhart.

M. staphylinoides, *Samou.* *Steph.* *Nitid. staphylinoides*, Marsh.

Frequent during the spring months; usually found adhering to the under surface of stones. I have taken a variety in Duddingston Wood, of an uniform rufous colour. Salisbury Craigs. Fields and road-sides south of Edinburgh.

Fam. ENGIDÆ.

Gen. ATOMARIA.

A. mesomelas, *Steph.* *Silpha phœorrhœa*, Marsh.

Among the roots of withered grass. Figget Whins.

Gen. CRYPTOPHAGUS.

C. Lycoperdi, *Herbst.* *Steph.* *Cortic. rufa*, Marsh.

Inhabits Lycoperdon bovista, Latticed Puff-ball. Roots of grass on sand-banks near the sea. Figget Whins.

C. cellaris, *Payk.* *Leach.* *Steph.* *Cortic. denticulata*, Marsh.

Has been taken on walls near Ravelston, and elsewhere.

Gen. ANTHEROPHAGUS.

A. pallens, *De Jean.* *Teneb. pallens*, Linn. Marsh.

Not common. Woods on the banks of the Almond, above Cramond Bridge.

Gen. BYTURUS.

B. tomentosus, *Latr.* *Der. tomentosus*, Fab. Marsh. *Der. flavescens*, Marsh., is a variety.

Woods and shrubby places, not very common. It frequents the flowers of various plants, for the purpose of feeding on the pollen, employing its palpi to lay open the anthers. Rosslyn woods. May.

Gen. Bitoma.

B. crenata, *Herbst.* *Steph.* *Curtis*, vol. vi. pl. 283.

Mr Curtis informs us that this insect had not been discovered when Marsham published his Coleoptera, but that it was taken a few years afterwards by Mr Haworth, and has been found more recently in the New Forest, under the bark of beech-trees. It inhabits Duddingston Wood in this neighbourhood, where it feeds on the Polyporus squamosus.

Gen. Corticaria.

C. crenulata, *Steph.*

Not common.

C. gibbosa, *Steph.* *Cortic. impressa*, Marsh.

At the roots of grass in damp shady places, occasional.

Gen. Latridius.

L. porcatus, *Herbst.* *Steph.* *Cortic. pulla*, Marsh.

Usually found among grass, and under the bark of trees, not unfrequent. Figget Whins, &c. &c.

L. ferrugineus, *Kirby.* *Steph.*

Among grass at Ravelston.

Fam. DERMESTIDÆ.

Gen. Dermestes.

D. lardarius, *Linn.* *Marsh.* *Steph.*

On decaying animal substances, &c.; generally in or near houses, not unfrequent.

D. murinus, *Linn.* *Marsh.* *Don.* *Steph.*

In such situations as the preceding, but not so common.

Gen. Attagenus.

A. Pellio, *Leach. Steph. Der. pellio,* Linn. Marsh.

Not uncommon in outhouses and cellars, attacking dried skins, old books, paper, &c.

A. trifasciatus, *Leach. Steph. Curtis,* vol. vi. pl. 247.

"The only examples I have seen of this species are contained in the collections of the British Museum, and in that of Mr Haworth; the former specimens were taken by Dr Leach, near Edinburgh." Steph. Illus. It has not occurred near Edinburgh, nor, as far as I know, in Scotland, except in the instance mentioned.

Sub.-Sec. HELOCERA.

Fam. BYRRHIDÆ.

Gen. Anthrenus.

A. Scrophulariæ, *Fab. Steph. Byrrhus Scrophulariæ,* Linn.

This insect was found by Mr Stewart, and is included in his list. I am not aware that it has been met with in this neighbourhood since.

Gen. Byrrhus.

B. pilula, *Linn. Steph. Cistela pilula,* Marsh.

Not very scarce; under stones in sandy situations, among short grass in dry pastures, and occasionally under dead animals. Arthur's Seat, Pentland Hills, &c. Several varieties occur. March—July.

B. fasciatus, *Fab. Steph. Cis. undulata,* Marsh.

Considerably more abundant than the preceding. It is most plentiful in sandy fields near the sea; and, in some seasons, appears in great numbers on Fisherrow and Musselburgh Links, in the months of March and April.

B. dorsalis, *Fab. Steph. Cis. dorsalis*, Marsh.

Not so common as either of the preceding species, but occurring at times in sandy places during the spring months. Salisbury Craigs.

B. sericeus, *Steph. Byrrhus varius*, Fab. *Cis. sericea*, Marsh.

On walls and pathways under trees, not very frequent. Near Collinton. Rosslyn. May.

Var. β of Steph. Illus. is occasionally met with.

B. æneus, *Fab.*

Oblongo-ovatus, supra æneus, griseo pubescens, scutello albido, elytris vagè punctatis.

Oblong-ovate, shining grassy green above, with a cinereous pubescence; forehead convex, punctured; thorax short, very convex, punctulated; scutellum whitish; elytra very convex, irregularly punctate, but not striated; body clothed beneath with a dense ashy pile; antennæ pitchy-black.

This well-marked species, which I have now the pleasure of adding to the British Fauna, was taken last June in an open part of a wood near Newbattle House, and it has occurred since under stones on Musselburgh Links. It is likewise found in Dumfries-shire.

Gen. SIMPLOCARIA.

S. semistriata. *Steph. Cis. picipes*, Marsh. Curtis, vol. vii. pl. 335.

Under stones in sandy places. Salisbury Craigs, August. Banks of the Water-of-Leith, near Bell's Mills, March.

Fam. HISTERIDÆ.

Gen. Hister.

H. unicolor, *Linn.* *Steph.* *His. inæqualis*, Marsh.

Frequent under stones, and on dead animals. King's Park. Sea-shore, &c.

H. cadaverinus, *Leach.* *Steph.* *His. unicolor*, Marsh.

Plentiful on carcasses, on the shores of the Firth of Forth. May—August.

H. carbonarius, *Leach.* *Steph.* *His.* 12–*striatus*, Fab.

Not so frequent as the two preceding species.

H. purpurascens, *Fab.* *Steph.* *His. bipustulatus*, Marsh.

More plentiful seemingly in the Edinburgh district than in most parts of the south of Scotland. Sea-shore at Leith and Portobello. Salisbury Craigs. Morningside. May—August.

H. maritimus, *Kirby.* *Steph.*

Not common. Shore west of Newhaven. Sand-bank near Canonmills. April—August.

H. æneus, *Fab.* *Marsh.* *Steph.*

Plentiful in cow pastures. King's Park. Fields about Corstorphine, &c.

H. rotundatus, *Steph. Illus.* *Dend. rotundatus*, Steph. Catal. *Hister piceus*, Marsh.

This minute, but well defined species, recently described by Mr Stephens, has been taken several times near Cramond, but it is far from common.

Gen. Dendrophilus.

D. punctatus, *Curtis.* *Steph.* *His. punctatus*, Illig.

This rare insect occurs very sparingly under the bark of trees at Cramond.

Sub.-Sect. *LAMELLICORNES.*

Fam. GEOTRUPIDÆ.

Gen. Geotrupes.

G. sylvaticus, *Latr.* *Steph.* *Scar. sylvaticus,* Marsh. Don.

A rare species in this district. It has been taken in a wood near Dreghorn, at the bottom of the Pentland Hills. It is the most abundant species of the genus in the south of England.

G. stercorarius, *Latr.* *Steph.* *Scar. stercorarius,* Marsh. Don. ♂; *Scar. spiniger,* Marsh.

A common insect in this neighbourhood, and throughout the country. It is strictly coprophagous, and the circumstance of its excavating cylindric holes in the earth under its food, has suggested the generic name. It is most plentiful in spring and autumn.

Fam. APHODIIDÆ.

Gen. Aphodius.

A. Fossor, *Fab.* *Steph.* *Scar. Fossor,* Linn. Marsh.

Very plentiful throughout the summer, in pastures and by road-sides.

A. hæmorrhoidalis, *Illig.* *Steph.* *Scar. hæmorrhoidalis,* Linn. Marsh.

Not common.

A. fimetarius, *Illig.* *Steph.* *Scar. fimetarius,* Linn. Don. Marsh.

This common species is one of the coleopterous insects that appear earliest on the wing, being sometimes noticed so early as the beginning of March, and it is frequent in sheltered situations, and on highways, by the end of that month.

A. scybalarius, *Illig. Steph. Scar. coprinus,* Marsh. Don. Not common. Musselburgh Links.
Scar. conflagratus, Fab. Don. Marsh. is a variety.

A. rufescens, *Fab. Steph. Var. β, Scar. unicolor,* Marsh. Salisbury Craigs, occasional. June.

A. sordidus, *Illig. Steph. Scar. sordidus,* Fab. Marsh. Don. Not common.

A. conspurcatus, *Steph. Scar. conspurcatus,* Linn. Marsh. Not a common insect here, but it has been met with occasionally.

A. sticticus, *Creutz. Scar. conspurcatus,* Var. Marsh.
A very plentiful insect, and not easily distinguishable from some of the allied species. March—May.

A. inquinatus, *Creutz. Steph. Scar. inquinatus,* Linn. Marsh.
Not very common. Wall-tops on the shore west of Newhaven. April—May. The markings on the elytra are so variable that scarcely two specimens can be found alike.

A. terrestris, *Fab. Steph. Scar. terrestris,* Marsh.
Under stones and elsewhere, not rare. Arthur Seat. Pentland Hills, &c. April—June.

A. melanopus, *Kirby. Steph.*
Occasional. Arthur's Seat, near the summit. Calton Hill. April—May.

A. rufipes, *Fab. Steph. Scar. rufipes,* Linn. Marsh. Don.
One of the most abundant of the coprophagous beetles, and may be found throughout the greater part of the year, wherever their pabulum occurs.

A. luridus, *Fab.* *Steph.* *Scar. luridus*, Marsh.

Not very plentiful. It is sometimes entirely black. Scar. variegatus and Scar. nigro-sulcatus of Marsham, are varieties. Salisbury Craigs and Arthur's Seat. Mr JAMES STARK.

A. merdarius, *Illig.* *Steph.* *Scar. merdarius*, Oliv. Marsh.

This very distinct species is plentiful at times on the shore near Caroline Park, and in other places. May—June.

A. quadrimaculatus, *Illig.* *Steph.* *Scar. 4–maculatus*, Linn. Marsh. Don.

STEWART's List, Wern. Mem. vol. i.

A. Sus. *Illig.* *Steph.* *Scar. sus*, Fab. Marsh.

" Taken most abundantly, by J. RAWLINS, Esq., in a field by Ravelston Wood, near Edinburgh." Dr Leach. Steph. Illus.

Gen. PSAMMODIUS.

P. sabuleti, *Gyllen.* *Steph.* *Scar. punctulatus*, Marsh.

Not common. Under stones on the shore near Musselburgh.

FAM. TROGIDÆ.

Gen. ÆGIALIA.

Æ. globosa, *Latr.* *Leach.* *Steph.* *Scar. globosus*, Don.

Found on the shores of the Firth of Forth occasionally. Near Fisherrow. " Sands between Leith and Musselburgh." Dr Leach. Steph. Illus.

FAM. MELOLONTHIDÆ.

Gen. SERICA.

S. brunnea, *Macleay.* *Steph.* *Scar. brunneus*, Linn. Marsh.

Seems to be pretty generally distributed throughout the southern counties of Scotland, frequenting the wooded banks of rivers and grassy places. Banks of the Water of Leith below Slateford. Figget Whins. June—August.

Gen. MELOLONTHA.

M. vulgaris, *Fab. Steph. Scar. Melolontha,* Linn. Don. Marsh.

Occurs in single specimens near Dalkeith. It has also been found at Lanark, and more abundantly in some parts of Dumfries-shire. It is, however, sparingly distributed through Scotland, although but too plentiful in many of the English counties.

Gen. PHYLLOPERTHA.

P. Horticola, *Steph. Anomala Horticola,* Steph. Catal. *Scar. Horticola,* Linn. Marsh.

This insect, which is common in England, where it is known by the names of Fern Chaffer and Bracken Clock, is not unfrequent in some parts of the south of Scotland, although it appears to be very rare in the Edinburgh district. It occurred to Mr STEWART, and has been taken once or twice since.

SUBSECTIO V.

FAM. ELATERIDÆ.

Gen. CATAPHAGUS.

C. limbatus, *Steph. Hemir. limbatus,* Steph. Catal. *El. limbatus,* Fab. *El. nitidulus,* Marsh.

In woods, not unfrequent. Braid wood. Rosslyn, very abundant on the Galium cruciatum, Crosswort. May—June.

C. obscurus, *Steph.* *Hemir. obscurus*, Steph. Catal. *El. obscurus*, Linn. Marsh. *El. variabilis*, Fab.

Under stones in the King's Park, plentiful; in other places occasional. It may readily be confounded with the following, which LINNÉ conjectures may be a mere sexual variety of this species. April—July.

C. lineatus, *Steph.* *Hemir. lineatus*, Steph. Catal. *El. lineatus*, Linn. Marsh.

With the preceding, in the King's Park and elsewhere, not unfrequent.

Gen. ELATER.

E. minutus, *Linn.* *Marsh.* *Steph.*

This species occurs occasionally in grass fields, in the vicinity of woods, and in meadows. Banks of Braid Burn. Fields at Slateford. May—July.

E. holosericeus, *Fab.* *Marsh.* *Steph.*

Not a common insect, but occurring at times in the King's Park, and on Arthur's Seat. May—July.

Gen. HYPNOIDUS.

H. riparius, *Steph.* *El. riparius*, Fab. *El. æneus*, Marsh.

One of the most plentiful kinds, generally found beneath stones, and in all varieties of soil. Fields at the bottom of the Pentland Hills. Banks of the Water of Leith, and fields about Edinburgh. April—August.

H. quadripustulatus, *Steph.* *El. quadripustulatus*, Fab. Don.

Under stones on the sandy banks of the Esk, above Dalkeith. An immaculate variety likewise occurs.

Gen. PERIMECUS.

P. fulvipes, *Steph.* *El. castanipes*, Marsh.

" Found in rotten wood, and beneath the bark of decayed trees, in woods and hedges, near Edinburgh." Steph. Illus.

Gen. CTENICERUS.

C. pectinicornis, *Steph.* *El. pectinicornis*, Linn.

Not common near the town, but frequent among the Pentland Hills, and at Rosslyn. It begins to appear about the end of May.

C. cupreus, *Steph.* *El. cupreus*, Fab. Marsh.

Considerably more plentiful than the last. It is usually observed on the wing in clear weather.

Var. β, *El. chalybeus*, Sowerby. With the other not unfrequent. Salisbury Craigs and Arthur's Seat. Braid and Pentland Hills. May—July.

Gen. SELATOSOMUS.

S. æneus, *Steph.* *El. æneus*, Linn. *El. impressus*, Marsh.

Var. β, *El. germanus*, Linn. *El. cyaneus*, Marsh. Samou.

Common under stones, and among grass at Salisbury Craigs, and the base of Arthur's Seat. Blackford and Braid Hills. April—June.

Gen. CALODERUS.

C. Equiseti, *Steph.* *El. Equiseti*, Herbst.

" Near Edinburgh." Steph. Illus.

Gen. APLOTARSUS.

A. testaceus, *Steph.* *El. testaceus*, Fab.

Sides of fields and woods, not frequent. Corn fields on the south side of Blackford Hill. Lasswade. Rosslyn. July—August. This is a rare insect in England.

A. ochropterus, *Steph.*

An insect agreeing in every respect, but in size, with the description Mr STEPHENS gives of this species, was taken last July near Dalkeith. It was not larger than A. testaceus, but nearly of the same size.

A. rufipes, *Steph.* *El. rufipes*, Fab. Marsh.
Not frequent. Braid Hills. June.

A. Quercus, *Steph.* *El. Quercus*, Oliv. *N. G. tibialis*, Steph. Catal.
In woods and grassy places, rather rare. Braid Hill. Woods at Cramond.

Gen. ANATHROTUS.

A. niger, *Steph.* *El. niger*, Linn. *El. aterrimus*, Fab.
Hedge rows, skirts of woods, and corn fields, not common. Banks of the Water of Leith about half a mile below Slateford. Corn fields about Collinton. June—August.

A. hæmorrhoidalis, *Steph.* *El. hæmorrhoidalis*, Fab. *N. G. ruficaudis*, Steph. Catal. *El. sputator*, Marsh.
Plentiful in woods, grassy places, and sides of fields. Corstorphine woods. Craiglockhart wood. Dreghorn. Easter Duddingston, &c. May—August.

SUBSECTIO VI.

FAM. CEBRIONIDÆ.

Gen. ATOPA.

A. cervina, *Payk.* *Chry. cervina*, Linn. *Dascillus cervinus*, Curtis. v. pl. 216. ♂; *Crio. cervina*, Marsh. ♀; *Crio. cinerea*, Marsh.
Not so common near Edinburgh as in some other parts of the country. Arthur's Seat, Mr CURTIS. Rosslyn. June—July.

Fam. CYPHONIDÆ.

Gen. Cyphon.

C. lætus, *Steph.*

In woods and grassy places, occasional. Braid wood.

C. pubescens, *Fab.* *Steph.*

Near Edinburgh. Steph. Illus.

C. griseus, *Fab.* *Steph.*

In grassy places, and sometimes on flowers, frequent. Duddingston, Corstorphine, &c. June—July.

Crio. nigricans and Crio. concolor of Marsham are varieties.

Fam. LAMPYRIDÆ.

Gen. Lampyris.

L. noctiluca, *Linn.*

Observed near Canonmills and Lasswade, rare.

This interesting insect is by no means so widely distributed in Scotland as in England. It occurs, however, in Roxburghshire, Dumfries-shire, and along the southern border in the neighbourhood of Langholm. It has been taken by Mr Wilson near Rowardennan, on the banks of Lochlomond. Another luminous insect, the *Geophilus electricus*, has, I believe, been occasionally mistaken for the true glow-worm by casual observers, in the neighbourhood of Edinburgh.

Fam. TELEPHORIDÆ.

Gen. Telephorus.

T. ater, *Oliv.* *Steph.* *Canth. atra*, Linn.

Not so common as the following species, which it very closely resembles, but it has been taken occasionally in marshy places among the Pentland Hills.

T. flavilabris, *Steph.* *Canth. flavilabris*, Gyllen.

In fields and meadows, occasional. Banks of Duddingston Loch. Near Craigcrook. June—August.

T. testaceus, *De Geer.* *Steph.* *Canth. testacea*, Marsh. Linn.

On umbelliferous plants, occasional.

T. pallidus, *Oliv.* *Steph.* *Canth. pallida*, Fab. Marsh.

On umbelliferous plants in woods, not common. "Habitat in floribus Cratægi Oxyacanthæ, Maio et Junio." Marsh. Braid and Collinton woods.

T. melanurus, *Oliv.* *Steph.* *Canth. melanura*, Marsh. Fab.

Very plentiful on umbelliferous plants. It is later in appearing than most of the other species, being seldom seen before the beginning of July.

T. discoideus, *Steph.*

Pretty frequent. Braid wood. Rosslyn.

T. cyaneus, *Curtis*, vol. v. pl. 215. *Steph.* *Teleph. tricolor*, Steph. Catal.

It is not long since this fine species was ascertained to be a native of Britain. In England it is confined to the northern counties, having been found chiefly in Yorkshire and Cumberland. It appears to be considerably more abundant in Scotland, as it has been captured by the Rev. W. Little, both in Dumfries-shire and Roxburghshire. For notice of its occurrence in this neighbourhood, I am indebted to H. M. Watson, Esq., who met with it on the banks of the Water-of-Leith, near Currie.

T. pellucidus, *Steph.* *Canth. pellucida,* Fab.
Edinburgh, Steph. Illus.

T. cantianus, *Steph.*

Not a scarce species, especially in the well-wooded parts of the country. Rosslyn. Duddingston. Water-of-Leith at Slateford. Cramond. May—July.

T. fuscus, *Steph.* *Canth. fusca,* Linn. Marsh. Samou.

This species occurs in great plenty throughout the south of Scotland. It begins to appear in this neighbourhood about the middle of May, and continues to the end of July.

T. bicolor, *Steph.* *Canth. bicolor,* Fab.

Not very scarce on umbelliferous plants.

Gen. Malthinus.

M. biguttulus, *Steph.* *Teleph. biguttatus,* Oliv.

West end of Duddingston Loch. Banks of the Esk at Dalkeith. June, July.

Fam. MELYRIDÆ.

Gen. Malachius.

M. æneus, *Fab.* *Canth. ænea,* Linn. Marsh.

This insect occurred to Mr Stewart, and has been taken occasionally since, but it is far from common. It is found on the flowers of various plants, in the months of May, June, and July.

Fam. TILLIDÆ.

Gen. Necrobia.

N. violacea, *Oliv.* *Steph.* *Clerus Quadra,* Marsh.

On dead animals, dried bones, &c., occasional. Sea-shore. Salisbury Craigs. May—July.

N. ruficollis, *Oliv.* *Leach.* *Steph.* *Clerus ruficollis*, Marsh.

Very rare. A single specimen only has been met with, which was found on the stones behind the Glassworks at Leith.

FAM. PTINIDÆ.

Gen. PTILINUS.

P. pectinicornis, *Fab.* *Ptinus pectinicornis*, Linn. Marsh. ♀; *Ptinus serraticornis*, Marsh.

Mr STEWART's list. Inhabits old trees and wood in houses, which it perforates to destruction. Dr LEACH.

Gen. PTINUS.

P. Museorum, *Leach.*

This species is said by SAMOUELLE to be found in Edinburgh. Entomologist's Compendium, p. 375.

P. Fur, *Linn.* *Marsh.* ♂; *Ptinus testaceus*, Marsh.

Pretty frequent in old wood in houses, &c. Ptinus imperialis has been found on birch trees near Jedburgh.

Gen. ANOBIUM.

A. pertinax, *Oliv.* *Steph.* *Ptinus pertinax*, Linn. Marsh.

Frequent in old wood.

A. striatum, *Oliv.* *Steph.* *An. pertinax*, Fab.

With the other species, not very common.

A. molle, *Fab.* *Ptinus mollis*, Linn. Marsh.

In old wood, not very common.

Gen. CIS.

C. Boleti, *Latr.* *Ptinus Boletorum*, Marsh.

On the Polyporus versicolor, Changeable Polyporus, in

Duddingston Wood, very plentiful, May. Woods at Cramond, Dalkeith, and Rosslyn.

C. nitidus, *Gyllen.* *Anob. nitidum*, Fab.

On the old roots and stumps of trees, usually under the moss, feeding on minute Fungi. Duddingston Wood, with the last, in considerable numbers. May.

Fam. BOSTRICIDÆ.

Gen. Bostrichus.

B. domesticus, *Gyllen.* *Der. domesticus*, Linn.

Stewart's List. Wern. Mem. vol. i.

Gen. Hylesinus.

H. crenatus, *Fab.* *Ips sulcatus*, Marsh.

Beneath the bark of trees, and in rotten timber, not very common.

H. Fraxini, *Fab.* *Ips varius*, Marsh.

Inhabits the bark of trees, particularly the ash, and is pretty frequent on the wing in warm weather, in the vicinity of woods. Craiglockhart.

Gen. Hylurgus.

H. piniperda, *Latr.* *Der. piniperda*, Linn. *Ips piniperda*, Marsh.

Inhabits the Scotch Fir, perforating the wood and bark. The pale ferruginous variety, mentioned by Paykull, has been taken in this neighbourhood, and another with the elytra of a deep chesnut colour. Craiglockhart. Juniper Green.

H. ater, *Samou.* *Ips Boleti*, Marsh. Var. β; *Ips niger*, Marsh.

Not so common as the last. According to Marsham, it inhabits Boleti. Craiglockhart. June.

H. obscurus, *Samou. Curtis. Steph. Ips obscurus,* Marsh.

Not common. Cramond. Rev. W. Little.

SECTIO III.

Sub-sect.—RHINCHOPHORA.

Fam. CURCULIONIDÆ.

Gen. Calandra.

C. granaria, *Clairv. Steph. Cur. granarius,* Linn. Marsh.

Stewart's List, Wern. Mem. vol. i.

Gen. Mecinus.

M. semicylindricus, *Schön. Cur. semicylindricus,* Marsh.

Under stones in the King's Park and Leith Links, occasional.

Gen. Cionus.

C. Scrophulariæ, *Leach. Cur. Scrophulariæ,* Linn. Marsh.

On the flowers of the Scrophularia nodosa, Figwort, pretty frequent. Banks of the Esk about a mile above Musselburgh. Braid Burn. Dalkeith. June, July.

C. Blattariæ, *Clairv. Steph. Cur. bipustulatus,* Marsh.

This species has been taken on the Horse-radish, in a garden near Drumsheugh.

Gen. Ceutorhynchus.

C. Quercus, *Steph. Cur. Quercus,* Herbst. *Cur. pallens,* Marsh.

Not frequent. Braidwood. Shore near Granton. May —July. It is said to frequent the oak.

C. ruber, *Steph.* *Cur. ruber*, Marsh. Don.

Seemingly a very scarce species. Craiglockhart. May.

C. sulcicollis, *Steph.* *Cur. pleurostigma*, Marsh.

Not very common. In hedges and on wall-tops, occasional.

Gen. Nedyus.

N. assimilis, *Steph.* *Cur. assimilis*, Marsh.

Rather common; occurring on plants, wall-tops, trunks of trees, &c., in the summer months. Craiglockhart. Cramond.

N. Erysimi, *Steph.* *Cur. Erysimi*, Marsh.

Not rare; on wall-tops in the neighbourhood of woods, and on various plants.

N. contractus. *Steph.* *Cur. contractus*, Marsh.

Not unfrequent, and often found with the preceding. King's Park. Libberton, &c.

N. constrictus, *Steph.* *Cur. constrictus*, Marsh.

On the Horse-radish, and other cruciferæ, frequent. Fields about Edinburgh.

N. pollinarius, *Steph.* *Cur. dentatus*, Marsh.

Plentiful on the Nettle, Urtica dioica, and other plants. Salisbury Craigs, abundant. Duddingston. Road sides round Edinburgh. April—July.

N. pallidactylus, *Steph.* *Cur. pallidactylus*, Marsh.

Not so common as the last, but frequently met with on plants. Restalrig. King's Park, &c.

N. Echii, *Steph.* *Cur. Echii*, Marsh.

This species, one of the largest of the genus, occurs among the debris of Salisbury Craigs, where the Echium vulgare, Viper's Bugloss, grows so abundantly. It does not appear to be common.

N. troglodytes, *Steph.* *Cur. troglodytes*, Fab. Marsh.
Not frequent. Among grass on wall-tops at Craiglockhart.

Gen. CRYPTORHYNCHUS.

C. Lapathi, *Samou. Steph.* *Cur. Lapathi*, Linn. Marsh.
Near Coates. Sir PATRICK WALKER. It is occasionally found on willows.

Gen. AMALUS.

A. scortillum, *Schön.* *Steph.* *Cur. inflexus*, Marsh.
Not frequent. Craiglockhart.

Gen. ORCHESTES.

O. Quercus, *Steph.* *Cur. Quercus*, Linn. *Cur. rufus*, Don.

On the leaves of the oak in the wood at Braid Hermitage. May. It has been noticed in other places in the neighbourhood, but it is rather scarce.

O. Fragariæ, *Steph.* *Cur. Fragariæ,* Payk. Marsh.
This species is very common. It feeds on the leaves of various trees, but is most partial to the beech, which it disfigures much, by perforating the leaves with numerous small holes. It may be found in every wood round Edinburgh in the months of April, May, and June.

Gen. TACHYERGES.

T. Salicis, *Schön.* *Cur. Salicis,* Linn. Marsh. *Cur. Capreæ,* Fab. Don.

Seldom found in considerable numbers, but single specimens occur not unfrequently. It frequents willows, as the specific name indicates. Rosslyn. Cramond. May, June.

Gen. ANTHONOMUS.

A. Pomorum, *De Jean.* *Cur. Pomorum*, Linn. Marsh.

Occasional. Wall tops near woods, and in gardens. It has been taken on Corstorphine Hill in the winter, hybernating beneath lichens and the bark of trees. Cramond Bridge. Restalrig. Rosslyn.

A. ater, *Steph.* *Cur. ater*, Marsh.

Not frequent.

A. Rubi, *De Jean.* *Cur. melanopterus*, Marsh.

A few individuals of this species were taken from the common Bramble, last July, in hedge-rows near Collinton.

Gen. HYDRONOMUS.

H. Alismatis, *Schön.* *Cur. Alismatis*, Marsh.

Plentiful on aquatic plants in the pond of the Botanic Garden. Duddingston Loch, sparingly. It is often found in the water. May—July.

Gen. GRYPIDIUS.

G. Equiseti, *Schön.* *Cur. Equiseti*, Marsh.

Not common. It frequents the Equisetum arvense, Corn Horse-tail.

Gen. NOTARIS.

N. acridulus, *Steph.* *Cur. acridulus*, Linn. *Cur. resinosus*, Marsh.

Under stones in sandy situations, but not common. Braid Hill. Near Dalkeith.

Gen. Dorytomus.

D. Tortrix, *De Jean.* *Steph.* *Cur. Tortrix*, Linn. Marsh.

Not very common. Cramond, and elsewhere.

D. maculatus, *Steph.* *Cur. maculatus*, Marsh.

This species has been taken in the neighbourhood, but it is by no means common.

Gen. Pissodes.

P. Pini, *Germar.* *Steph.* *Cur. Pini*, Linn. *Rynch. Abietis*, Leach.

This insect is said by Dr Leach to have been discovered, as a native of Britain, by Dr Malden, who took it near Hameton, in Scotland. It is, I presume, the Cur. Abietis of Mr Stewart's List, who represents it as the rarest coleopterous insect inhabiting the neighbourhood of Edinburgh. It is inserted here on his authority.

The handsome and rare species P. notatus is likewise a Scotch insect, having been recently taken in Forfarshire.

Gen. Hypera.

H. punctata, *Curtis.* *Cur. medius* and *Cur. austriacus*, Marsh.

Rather a scarce species, and found only where the soil is sandy. Old Quarry at the Powder Magazine in the King's Park. Shore west of Newhaven.

H. fasciculosa, *Curtis*, iii. pl. 116.

This species is said by Mr Curtis, who has figured and described it, to be found in Norfolk, where, however, it is by no means common. It does not appear to be very scarce in Scotland, as it has been taken repeatedly in this neighbourhood, and in other parts of the country. It is usually found under stones in sandy places. Fisherrow Links. Musselburgh Race-course. May—June.

H. arator, *Curtis.* *Cur. arator*, Linn. Marsh.

Not a common species. Under stones on Fisherrow and Musselburgh Links in the spring, sparingly.

H. Rumicis, *Curtis.* *Cur. Rumicis*, Linn. Marsh.

On the common dock, and under stones, far from common.

H. nigrirostris, *Curtis.* *Cur. nigrirostris*, Fab. Marsh.

Pretty generally distributed, but occurring nowhere in greaty plenty. It has been noticed on Braid Hill, at Duddingston, and Figget Whins. May—August.

H. postica, *Curtis.* *Cur. bimaculatus*, Marsh.

Common on dry hilly pastures. Arthur's Seat, plentiful along with the Strophosomus Sus. April. Pentland, Braid, and Blackford Hills. April—July.

H. variabilis, *Curtis.* *Cur. variabilis*, Herbst.

Not common. Under stones and on plants in woods.

H. elongata, *Steph.* *Cur. elongata*, Payk. *Cur. fusco-cinerea*, Marsh.

Very scarce. Shore east of Musselburgh.

Gen. Liparus.

L. anglicanus, *Samou.* *Cur. anglicanus*, Marsh. Don.

This species has been taken occasionally in the neighbourhood by Sir P. Walker. It must be considered one of the rarer kinds of the Curculionidæ of Scotland.

Gen. Leiosoma.

L. punctata, *Steph.* *Cur. punctatus*, Marsh.

Occasional under stones. King's Park. Near Musselburgh. Craigmillar Castle.

Gen. Hylobius.

H. Abietis, *Germar.* *Steph.* *Cur. Abietis*, Linn. Stew. *Cur. Pini*, Marsh. Don. *Rynch. Pini*, Leach.

This insect was first ascertained to be an inhabitant of Britain by the late President of the Linnean Society, Sir J. E. Smith, who found it in Ravelston wood, near Edinburgh. The imperfect description of Linné, who appears in some of his works to have confounded it with another species, has rendered it difficult to identify his insect, and its synonymy is consequently involved in considerable complexity. From an inaccurately named specimen in the Linnean Cabinet, Marsham was led to believe that the present insect was the Cur. Pini, Linn., and accordingly described it under that name in his *Entomologia Britannica.* Neither Paykull nor Fabricius have described it with their usual perspicuity, the latter, in his *Species Insectorum*, regarding it as a sexual variety of an insect belonging to an entirely dissimilar genus. It is by no means a scarce species throughout Scotland, but it is said to be local in England, occurring chiefly in Cumberland and Shropshire. The larva inhabits the wood of the Scotch Fir (*Pinus sylvestris*), and often proves destructive to young plantations. The manners of the perfect insect are well described by Linné, in his peculiar style : " Tarde incedit, arcte apprehendit, tenaciter adhæret, ore frustra cutem mordere tentat captivus." It may be found from June to September *.

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* Some remarks on the habits and synonymy of Hylobius Abietis, by W. S. Macleay, Esq., will be found in the first volume of the Zoological Journal.

Gen. ALOPHUS.

A. triguttatus, *Schön.* *Cur. triguttatus*, Fab. Marsh. ♂; *Cur. striatirostris*, Marsh.

This appears to be a scarce insect in Scotland, and local in its distribution. It occurs in considerable numbers near Raehills, Dumfries-shire; confined, however, to a very narrow locality. In this neighbourhood it has been taken at Morningside, and near Collinton, in the month of May.

Gen. BARYNOTUS.

B. Mercurialis, *Steph.* *Cur. Æscidii*, Marsh. ♀; *Cur. tomentosus*, Marsh.

This species has been taken on the leaves of the Petasites vulgaris, common Butter-bur, by the sides of the Water-of-Leith, and in other places. May—August.

Gen. MERIONUS.

M. obscurus, *De Jean.* *Cur. obscurus, Fab.* *Cur. pilosulus*, Marsh.

Of pretty frequent occurrence. Under stones in the King's Park, and on Arthur's Seat. Shore at Granton. Fields east of Duddingston. April—August.

M. elevatus, *Steph.* *Cur. elevatus*, Marsh. *Var. β*, *Cur. carinatus*, Marsh.

Very rare in this neighbourhood. A few specimens have been obtained from the neighbourhood of Lasswade. It occurs sparingly near Raehills, and in some parts of Roxburghshire.

Gen. OTIORHYNCHUS.

O. Ligustici, *Schön.* *Cur. Ligustici*, Linn. Marsh.

The name of this species occurs in Mr STEWART'S List.

O. sulcatus, *Schön.* *Cur. sulcatus*, Fab. Marsh.

Rare. Braid Hills.

O. notatus, *Steph.* *Cur. vastator*, Marsh.

This species is found in considerable abundance throughout the south of Scotland, usually on plants and grass under trees. Woods round Edinburgh. Craiglockhart, very plentiful in June. King's Park, Corstorphine, &c.

O. rugifrons, *Schön.* *Cur. rugifrons*, Gyllen.

One of the largest of the Curculionidæ that inhabit this part of Scotland. Banks of the Water-of-Leith, at St Bernard's Well. Banks of the Esk near Inveresk Church, on the Symphytum tuberosum, Comfrey. May—Aug.

O. ovatus, *Schön.* *Cur. ovatus*, Linn. Marsh.

A common insect under stones. King's Park and places adjacent. April—October.

O. tenebricosus, *Schön.* *Cur. niger*, Marsh.

Sandy banks on the sea-shore, frequent. Between Leith and Portobello, and elsewhere. Spring and summer.

O. ater, *Schön.* *Cur. maritimus*, Don.

Shores of the Firth, very sparingly. It is not exclusively a maritime species, as it has been observed near the summit of one of the highest mountains in Scotland. Caroline Park.

O. piceus, *Steph.* *Cur. piceus*, Marsh.

Of frequent occurrence under stones and among moss. Salisbury Craigs. Braid Hill, &c.

O. scabrosus, *Steph.* *Cur. scabrosus*, Marsh.

Not frequent. Under stones in a loose soil. Braid Hill, &c.

O. scabridus, *Kirby.* *Steph.*

Much more plentiful than the preceding, which it resembles so closely in every thing but in size, that it may be readily taken for an immature variety. Marsham's description applies equally well to both. Under stones in the King's Park, and in fields around Edinburgh.

Gen. PHILOPEDON.

P. geminatus, *Schön.* *Cur. maritimus*, Marsh.

A maritime species, occurring plentifully along the shores of the Firth, particularly on Fisherrow and Musselburgh Links. It varies greatly in size and colour, and even in sculpture.

Gen. STROPHOSOMUS.

S. Coryli, *Schön.* *Cur. Coryli*, Fab. Marsh.

A frequent inhabitant of woods, particularly of those where the hasel occurs. Braid Wood. Cramond. Craigmillar. Rosslyn. May—August.

S. squamulatus, *Schön.* *Cur. squamulatus*, Fab.

In bushy places and among grass, not so common as the other species. Braid wood.

S. Sus, *Steph.* *Cur. limbatus*, Marsh.

Plentiful on the hills around Edinburgh, and in pastures. Pentland Hills. Arthur's Seat. Craiglockhart. Calton Hill. April—June.

Gen. SCIAPHILUS.

S. muricatus, *Schön.* *Cur. muricatus*, Fab. *Cur. setosus*, Marsh.

In woods and bushy places, not very common. South side of Blackford Hill, &c.

Gen. SITONA.

S. Ulicis, *Kirby.*

On furze and broom, frequent on the Braid Hills and elsewhere. May—June.

S. lineata, *Samou.* *Steph.* *Cur. lineatus*, Linn. Marsh.

Occurs in great profusion on wall tops, on stones, &c. all round Edinburgh. April—August.

S. subaurata, *Kirby.* *Steph.*

This species has been captured oftener than once near Edinburgh, but the special localities have not been recorded.

Gen. Polydrusus.

P. cervinus, *Steph.* *Cur. cervinus*, Linn. Marsh.

Stewart's List, Wern. Mem. vol. i.

P. micans, *De Jean.* *Cur. Pyri*, Linn. Marsh.

Occurs in tolerable abundance on trees in the months of May, June and July. On the elm in the Meadows. Braid wood. Woods at Dalkeith and Rosslyn.

P. undatus, *Steph.* *Cur. undatus*, Fab. *Cur. seleneus*, Marsh.

Rare in this part of the country, but frequent in Dumfries-shire.

Gen. Sporadelepius, *Steph. MSS.*

S. oblongus, *Steph.* *Cur. oblongus*, Linn. Marsh. Var. *β. Cur. rufescens*, Marsh.

On trees and hedges, and sometimes on herbaceous plants, plentiful. Braid wood. Duddingston wood. Corstorphine. Morningside. May—August.

Gen. Phyllobius.

P. Pyri, *Schön.* *Cur. Pyri*, Linn.

Frequents the foliage of trees, and is very common. It is a variable species both in size and colour. The most ordinary colour is ochraceous yellow, but the scales on the upper surface are often rubbed off, when it appears of a dull black. Varieties of a bright green are of frequent occurrence; in which state may it not be the Cur. cæsius of Marsham?

P. Alneti, *Steph.* *Cur. Cnides*, Marsh.

On trees by the side of the Water-of-Leith, to the west of Edinburgh, rare.

P. argentatus, *Schön.* *Cur. argentatus*, Linn. Marsh.

Frequent on the oak and hasel, from May to August. Rosslyn. Cramond. Braid Wood, &c.

P. Mali, *Schön.* *Cur. Mali*, Fab. Marsh.

On trees and herbaceous plants, very common. Salisbury Craigs, on the nettle. Corstorphine. Cramond. Craiglockhart, &c. May—August.

P. uniformis, *Steph.* *Cur. uniformis*, Marsh.

On the nettle, Urtica dioica. Like the other members of the genus it is gregarious, and when it does occur, it is generally in considerable numbers. King's Park and elsewhere.

P. parvulus, *Schön.* *Cur. parvulus*, Fab.

Not common. It has been taken frequently in the vicinity of Edinburgh, but I do not recollect the exact localities.

P. viridicollis, *Schön.* *Cur. viridicollis*, Fab.

This species appears at times in great profusion near Edinburgh. It frequents herbaceous plants, and does not confine itself to any particular species. Like many of its congeners, it is often found on the nettle. Salisbury Craigs. Blackford Hill. Rosslyn. May, June.

Gen. CLEONUS.

C. sulcirostris, *Schön.* *Cur. sulcirostris*, Linn. Marsh.

This is likely to prove one of the rarest of the Scotch Curculionidæ. It is accounted a scarce insect in England, where it occurs chiefly in the south, and never in considerable numbers. It is almost invariably found in sand-pits, a situation in which its colour is admirably calculated to secure it from observation. It has been taken only once in this neighbourhood, in an old quarry of sandstone on the shore at Joppa. July.

Gen. Apion.

A. Rumicis, *Kirby.*

On the different species of the genus Rumex, but not very common. Craiglockhart. Braid Hill.

A. Hydrolapathi, *Kirby. Cur. Hydrolapathi,* Marsh.

Not very frequent. "Habitat in Rumicibus Lapathis," Kirby.

A. Malvæ, *Kirby. Attel. Malvæ,* Fab. *Cur. Malvæ,* Marsh.

On the common Mallow, not very frequent near Edinburgh. James Wilson, Esq.

A. hæmatodes, *Kirby. Germ.*

Among grass at Figget Whins and elsewhere, but not common.

A. frumentarium, *Kirby. Cur. frumentarius,* Marsh. Linn.

This species is met with occasionally near Edinburgh, and in other parts of Scotland. When in its perfect state, it inhabits the common dock.

A. Radiolus, *Kirby. Germar. Cur. Radiolus* and *Cur. aterrimus,* Marsh. *Ap. oxurum,* Kirby.

Common on the Mallow.

A. æneum, *Herbst. Kirby. Cur. æneus*, Fab. Marsh.
Frequent on the Malva sylvestris, Common Mallow. Musselburgh. Portobello. Salisbury Craigs, &c.

A. Pisi, *Germar. Attel. Pisi*, Fab. *Cur. striatus*, Marsh. *Ap. striatum*, Kirby.
Frequent on broom. Braid Hills. Craiglockhart, &c. May—August.

A. immune, *Kirby*.
Not very frequent. It inhabits broom and furze.

A. virens, *Kirby. Germar. Ap. æneocephalum*, Gyllen.
Not common.

A. Marchicum, *Kirby. Germar. Ap. violaceum*, Gyllen.
This species, which resembles the preceding so closely that Mr Kirby conjectures it may prove only a sexual variety, is found occasionally among grass, and on wall-tops.

A. flavipes, *Herbst. Kirby*.
Frequent in spring in hedges, on stones, &c. It is sometimes plentiful in the autumn on the leaves of the hasel. The larva feeds on the Trifolium repens, Dutch Clover.

A. flavifemoratum, *Kirby. Cur. Trifolii*, Var. Marsh.
The most common species of the genus in this neighbourhood, and may be met with throughout the spring and summer. Both in the larva and perfect state it frequents the common red clover (Trifolium pratense), in fields of which it often commits great devastation *.

A. Viciæ, *Kirby. Germar.*
On the Vicia Cracca, Tufted Vetch, occasional. Banks of the Water-of-Leith and Almond. July, August.

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* For an account of this insect, with whose history and economy it is of importance for the agriculturist to be acquainted, reference may be made to several interesting articles in the Sixth Volume of the Transactions of the Linnean Society.

A. Ononis, *Kirby. Germar.*

On the Ononis arvensis, Rest-harrow, not unfrequent. Salisbury Craigs. Banks of the Water-of-Leith at Slateford. Shore west of Granton. July—September.

A. Lathyri, *Kirby.*

On the Lathyrus pratensis, Meadow Vetchling, but not common. Hedges west of Edinburgh. Banks of the Almond, a little above the bridge on the Queensferry road. July, August.

A. punctifrons, *Kirby.*

This species has been taken frequently near Edinburgh, but I am unable to give the exact localities.

Gen. OXYSTOMA.

O. Ulicis, *Steph. Apion Ulicis,* Kirby. *Cur. Ulicis,* Marsh.

On the common furze. It may be found throughout the summer, but is most abundant in the early spring months. Braid Hill. Corstorphine Hill. Pentland Hills. It is a curious circumstance that this insect, though so abundant in Britain, has not been found on the continent.

Gen. RHYNCHITES.

R. Betulæ, *Steph. Cur. Betulæ,* Linn. Marsh. Var. β, *Cur. nitens,* Marsh.

Not common. It is found on the white-thorn and alder.

Gen. ATTELABUS.

A. curculionoides, *Linn. Marsh.*

A few individuals of this species have been taken on Corstorphine Hill, by Sir P. WALKER. It frequents the hasel.

Gen. Apoderus.

A. Avellanæ, *Oliv.* *Attel. Avellanæ*, Linn. Marsh.

On the hasel, but not frequent in this neighbourhood. It is rather plentiful in hasel coppices in some parts of Roxburghshire in the autumn. Corstorphine Hill. Rosslyn. July, August.

Fam. SALPINGIDÆ.

Gen. Salpingus.

S. planirostris, *Gyllen.* *Cur. planirostris*, Marsh.

On the trunks of trees in Duddingston Wood, concealed in the crevices of the bark, May. Water-of-Leith near Bell's Mills, August. Craiglockhart, March.

SUBSECTIO II.

Fam. CERAMBYCIDÆ.

Gen. Acanthocinus.

A. ædilis, *De Jean. Steph.* *Ceram. ædilis*, Linn. Marsh.

Specimens of this insect from the neighbourhood of Kirkcaldy, in Fifeshire, are preserved in the cabinet of Sir P. Walker.

Gen. Pogonocerus.

P. nebulosus, *De Jean. Steph.* *Ceram. nebulosus*, Marsh. Don. vol. xi. pl. 394.

Rare. It has been found near Cramond. According to Fabricius and Gmelin, its natural habitat is the trunks of pine trees.

Gen. Clytus.

C. Arietis, *Leach. Curtis.* *Lep. Arietis*, Linn Don. *Ceram. Arietis*, Marsh.

This is not a scarce insect in England, but it appears to be of rare occurrence in Scotland. It has been taken in gardens near Drumsheugh, and in other places to the west of Edinburgh.

FAM. LEPTURIDÆ.

Gen. RHAGIUM.

R. bifasciatum, *Fab.* *Lep. bifasciata,* Marsh. *Ceram. anglicus,* Gmel. Stew.

In decaying trunks of trees, not uncommon. Rosslyn, plentiful in October. Woods at Dalkeith. Woods on the banks of the Almond.

SECTIO IV.

SUB.-SEC. EUPODA.

FAM. CRIOCERIDÆ.

Gen. DONACIA.

D. Lemnæ, *Fab.* *Lep. vittata,* Marsh. *Don. marginata,* Hoppe.

On the leaves of the Iris Pseud-acorus, and other plants. Duddingston Loch, rather plentiful. June, July.

D. Sagittariæ, *Fab.* *Lep. sagittariæ,* Marsh. *Don. aurea,* Hoppe. With the preceding, not very frequent.

D. Proteus, *Kunzé.* *Steph.*

Var. α. *Lep. Nymphaeæ,* Marsh.

Marshy spot among the Pentland Hills. Lochend. Muttonhole.

D. micans, *Kunzé.* *Don. ænea,* Hoppe. *Lep. ænea,* Marsh.

On the leaves of the Potamogeton natans, Broad-leaved Pond-weed. Braid Hill marshes, in considerable numbers. Muttonhole. May, June.

D. linearis, *Hoppe*. *Lep. linearis*, Marsh.

The most plentiful species of the genus, occurring abundantly on plants at Duddingston Loch, Lochend, Ditches near Craigcrook, &c. May—August.

Gen. CRIOCERIS.

C. cyanella, *Panz*. *Steph*. *Auch. cyanella*, Marsh.

Not common. Found in woods and grassy places, occasionally. Rosslyn woods, June.

C. melanopa, *Samou*. *Steph*. *Auch. melanopa*, Marsh.

More frequent than the preceding, but it is impossible to assign any fixed habitat. June—August.

C. Asparagi, *Samou*. *Steph*. *Auch. Asparagi*, Marsh.

Rare. It has been taken in the neighbourhood of Edinburgh by Sir P. WALKER. The larva feeds on the leaves of the Asparagus officinalis.

SUB. SEC. CYCLICA.

FAM. GALERUCIDÆ.

Gen. GALERUCA.

G. Tanaceti, *Fab*. *Chry. Tanaceti*, Linn. Marsh.

Pentland Hills. Coates.

G. Capreæ, *Fab*. *Crio. Capreæ*, Marsh.

This species does not appear to be common, but it has occurred oftener than once in this neighbourhood.

G. lineola, *Fab*. *Steph*.

Rare. Arthur's Seat, on furze bushes. June. H. M. WATSON, Esq.

Gen. LUPERUS.

L. rufipes, *Leach*. *Auch. rufipes*, Marsh.

Rare. Rosslyn.

Gen. Haltica.

H. Nemorum, *Panz.* *Kirby.* *Chry. Nemorum*, Linn. Marsh.

This species, well known to farmers by the name of Turnip Fly, is very common in fields and on wall-tops near Edinburgh.

H. Pseud-acori, *Samou.* *Steph.* *Chry. Pseud-acori*, Marsh.

On the leaves of the Iris pseud-acorus, Water Iris. At Dalmeny, in tolerable plenty. Miss Hope Johnstone.

H. tabida, *Gyllen.* *Steph.* *Chry. tabida*, Marsh.

In grassy places, and on plants, occasional.

H. confinis, *Kirby.* *Steph.*

This species has been frequently taken in the autumn in grass fields and woods.

H. suturalis, *Samou.* *Steph.* *Chry. suturalis*, Marsh.

On nettles and various other plants. Salisbury Craigs and Arthur's Seat, plentiful. May—August.

H. Anchusæ, *Steph.*

Not a very common species.

H. Napi, *Gyllen.* *Steph.*

Frequent during the spring months on stones and walls, in warm weather. Arthur's Seat. Walls near Ravelston, &c. March—May.

H. brunnipes, *Megerle.*

Not a common species.

H. ferruginea, *Illig.* *Steph.* *Chry. transversa*, Marsh.

Frequent among nettles in waste places. Duddingston. Banks of Braid Burn at Blackford Hill, &c. May—Aug.

H. rufipes, *Steph.* *Chry. rufipes*, Linn. *Chry. ruficornis*, Marsh. Don.

Not unfrequent on plants and among grass. Braid Burn. Salisbury Craigs, &c. May—July.

H. Helxines, *Steph.* *Chry. Helxines*, Linn. Marsh.

On umbelliferous plants, particularly Angelica sylvestris, Wild Angelica, in woods near Rosslyn, sparingly. July—August.

H. cyanea, *Samou.* *Steph.* *Chry. cyanea*, Marsh.

On cruciferous plants, occasional. Easter Duddingston and elsewhere. May—June.

H. Oleracea, *Steph.* *Chry. Oleracea*, Linn. Marsh.

On oleraceous plants in gardens, not unfrequent. June—August.

H. testacea, *Steph.* *Chry. testacea,* Fab. Marsh.

Pretty frequent on plants, particularly nettles and black knapweed. Salisbury Craigs, &c. &c. July—September.

H. concinna, *Samou.* *Steph.* *Chry. concinna*, Marsh.

This very minute but well marked species is not very common. It has been taken on Arthur's Seat.

H. picipes, *Kirby.* *Steph.*

On stones and walls, occasional. Salisbury Craigs and other places. April—June.

FAM. CHRYSOMELIDÆ.

Gen. PHÆDON, *Steph. MSS.*

P. Betulæ, *Steph.* *Chry. Betulæ*, Linn. Marsh.

Pretty frequent among herbage, and sometimes on trees.

Gen. CHRYSOMELA.

C. tumidula, *Kirby.* *Steph.*

Banks of the Water-of-Leith and elsewhere, in considerable plenty. May—June.

C. Vitellinæ, *Linn.* *Marsh.*

On willows and poplar trees, common. Banks of the Water-of-Leith. On poplar trees by the side of the road leading from Restalrig to the shore. June—September.

C. Polygoni, *Linn.* *Marsh.* *Don.*

Feeds on the Polygonum aviculare, Knotgrass, and may be found not unfrequently in places where that plant abounds. Figget Whins.

C. Raphani, *Fab.* *Chry. Hypochæridis*, Marsh. Don.

On the large-leaved docks, not very common. East end of Duddingston Loch. Figget Whins, plentiful. June—August.

C. fastuosa, *Linn.* *Don.* *Marsh.*

This beautiful and local species occurs in great plenty on the Lamium album, White Dead-nettle, at the base of Salisbury Craigs. It has likewise been noticed near Restalrig, and was formerly abundant on the above named plant, by the side of the footpath leading from Stockbridge to St Bernard's Well. James Wilson, Esq. May—July.

C. decempunctata, *Linn.* *Marsh.*

A scarce insect, usually found in well wooded places. Rosslyn. Lasswade.

C. litura, *Fab.* *Marsh.*

Var. β. *Chry. olivacea*, Marsh.
Var. γ. *Chry. rufitarsis*, Marsh.

Very plentiful in many parts of the south of Scotland, on the broom. Var. α. seems to be most plentiful in the early spring months; Var. β. in the summer and autumn. The last mentioned variety is rare at all times. Braid and Blackford Hills. Craiglockhart. Pentland Hills. Corstorphine.

C. marginata, *Linn. Marsh.*

On hills and elevated pastures, not scarce. Calton Hill. Arthur's Seat. Pentland Hills. April—June.

C. Staphylæa, *Linn. Marsh.*

At the roots of hedges, under stones, &c. frequent. Arthur's Seat. Fields at Duddingston. Braid and Blackford Hills, &c. April—August.

C. polita, *Linn. Marsh.*

Weedy places, grassy banks, &c., frequent. South side of the wood at Duddingston. Laverock Bank, Trinity. J. WILSON, Esq. Banks of the Water-of-Leith below Saughton Hall. It was very abundant in this situation in the summer of 1829 on the Glechoma hederacea, Ground Ivy.

C. varians, *Fab. Chry. Marshami*, Don. Marsh.

Woods, occasional, on the Hypericum perforatum and hirsutum, St John's Wort. Woods on the banks of the Water-of-Leith below the Aqueduct at Slateford, plentiful in September and October. It is not scarce in Roxburghshire, where the rarer Chry. geminata also occurs.

C. hæmoptera, *Linn. Marsh.*

Not common. Arthur's Seat. June.

C. Goettingensis, *Linn. Don. Marsh.*

Rare. Near Coates. Sir PATRICK WALKER.

Gen. TIMARCHA.

T. Populi, *Steph. Chry. populi*, Linn. Marsh.

Observed occasionally near Rosslyn and Lasswade.

T. ænea, *Steph. Chry. ænea*, Linn. Marsh.

Not a scarce insect in some parts of the south of Scotland, but not very plentiful near Edinburgh. Cramond.

T. marginella, *Steph.* *Chry. marginella*, Linn. Marsh.
On the flowers of the Ranunculus acris, Upright Meadow Crowfoot, not unfrequent. Margin of Duddingston Loch. Banks of the Canal. May and June.

Gen. Helodes.

H. Phellandrii, *Fab.* *Chry. Phellandrii*, Linn. Marsh. *Chry. calmariensis*, Don.
On aquatic plants, frequent. Braid Hill marshes. Duddingston Loch. Lochend. May—July.

H. Beccabungæ, *Payk.* *Chry. Beccabungæ*, Marsh. *Hel. violacea*, Fab. Leach.
No so common as the preceding. On the Veronica Beccabunga, Brooklime, and other subaquatic plants. Braid Burn. Ditches at the west end of Duddingston Loch. May—August.

Fam. CASSIDIIDÆ.

Gen. Cassida.

C. rubiginosa, *Illig.* *Cass. similis*, Marsh.
Lane leading from the west of Maitland Street to the Dean Bridge, Water-of-Leith.

C. equestris, *Fab.* *Cass. viridis*, Marsh.
Inhabits various kinds of mint, and other labiate plants, not very common. Fields at Corstorphine. August—September.

Sub. Sec. TRIMERI.

Fam. COCCINELLIDÆ.

Gen. Chilocorus.

C. bipustulatus, *Samou.* *Coc. 2–pustulata*, Linn. Marsh.
Not very frequent, but occurring at times in woods and on wall tops, &c. Craiglockhart.

C. renipustulatus, *Steph.* *Coc. Cacti*, Marsh.
In such places as the preceding.

Gen. Coccinella.

C. quatuordecimguttata, *Linn.* *Don.* *Marsh.*
Occasional. Collinton woods. Banks of the Water-of-Leith at Slateford.

C. sedecimguttata, *Linn.* *Marsh.*
On the hasel at Rosslyn and elsewhere.

C. oblongo-guttata, *Linn.* *Don.* *Marsh.*
Found in fir woods, occasionally. Corstorphine Hill. Dreghorn. It is frequently taken on the broom.

C. septempunctata, *Linn.* *Don.* *Marsh.*
Common almost everywhere in spring and summer. It sometimes survives the winter, and reappears about the middle of February.

C. quinquepunctata, *Linn.* *Marsh.* *Don.*
On flowers, not very rare. Botanic Garden, &c.

C. vigintiduopunctata, *Linn.* *Don.* *Marsh.*
Var. β. *Coc. vigintipunctata*, Fab. Marsh.
Not common. On nettles at Coates.

C. variabilis, *Illig.* *Steph.*
Several varieties of this very variable species occur near Edinburgh.

C. dispar, *Illig.* *Curtis.* *Steph.*
α; *Coc. bipunctata*, Linn. Marsh. Frequent on flowers.
μ; *Coc. sexpustulata*, Linn. Don. Marsh. Common. Under the trees in the Meadows. In the crevices of the bark of trees at Duddingston, &c.
ν; *Coc. quadripustulata*, Fab. Marsh. Occurs with the preceding, and is equally common. This species survives

the winter, securing itself under the bark of trees. It is a more formidable enemy to the aphides than any of the others.

C. impustulata, *Linn.* *Steph.*
On plants by the side of the Esk near Dalkeith. May.

C. undecimpunctata, *Linn.* *Marsh.* *Don.*
Not very scarce.

C. octodecimguttata, *Linn.* *Marsh.*
Craiglockhart. Collinton. Rosslyn, &c.

C. tredecimpunctata, *Linn.* *Marsh.* *Don.*
In woods and fields.

C. novemdecimpunctata, *Linn.* *Marsh.*
Near Coates, not frequent.

Gen. Rhyzobius.

R. Litura, *Steph.* *Der. coadunatus*, Marsh. *Der. hypomelanus*, *Der. pallidus*, *Der. Absinthii*, Marsh, are varieties.

Not unfrequent among moss, at the roots of grass, under stones, &c. Figget Whins, and other places along the coast. Salisbury Craigs. April—August.

Gen. Cacicula.

C. pectoralis, *Steph.* *Chry. pectoralis*, Fab. *Silpha rosea*, Marsh.

At the roots of the sea-reed on sand banks near the sea. Figget Whins. Duddingston Loch. It is occasionally found in the water.

SECTIO V.

FAM. TENEBRIONIDÆ.

Gen. TENEBRIO.

T. Molitor, *Linn.* *Marsh.*

The larva of this species is known by the name of Mealworm. The perfect insect, which is not common in this quarter, is found in bakehouses and cellars, associated sometimes with Acheta domestica and Blaps mortisaga. It is also found in the fields.

FAM. BLAPSIDÆ.

Gen. BLAPS.

B. mortisaga, *Fab.* *Marsh.* *Ten. mortisagus,* Linn.

Frequent in cellars, outhouses, &c.

FAM. HELOPIDÆ.

Gen. HELOPS.

H. cæruleus, *Fab.* *Bl. violacea,* Marsh. *Ten. chalybeus,* Linn.

In decayed trees, and under bark, not common. Near Edinburgh. Sir P. WALKER.

H. caraboides, *Panz.* *Blaps Spartii,* Marsh. *Tenebrio caraboides,* Stewart's List*.

It has been recently taken by the side of the Esk near Dalkeith.

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* The *Helops quisquilius,* Fab., *Pimelia quisquilia,* Linn., inserted by Mr STEWART in his List, has not been ascertained to be indigenous to Britain.

Gen. CISTELA.

C. murina, *Fab.* *Chry. murina,* Linn. *Crio. murina,* Marsh.

Among moss at the roots of trees, not very frequent. Corstorphine Hill.

FAM. MELANDRYIDÆ.

Gen. MELANDRYA.

M. caraboides, *Latr.* *Chry. caraboides,* Linn. *Crio. caraboides,* Marsh.

Not common. This is not a rare insect in England, where, according to Mr CURTIS, it is commonly found under the bark of decaying trees from March to June.

FAM. MORDELLIDÆ.

Gen. ANAPSIS.

A. ruficollis, *Steph.* *Mord. ruficollis,* Oliv. Marsh.

On umbelliferous plants, particularly those of the genus Chærophyllum. Woods at Dalkeith. Banks of the Esk above Musselburgh. May—July.

A. obscura, *Steph.* *Mord. obscura,* Marsh.

With the preceding, and rather more plentiful.

A. nigricollis, *Steph.* *Mord. nigricollis,* Marsh.

With the foregoing species, but not so common as either of them. Banks of the Almond.

Gen. MORDELLA.

M. aculeata, *Linn.* *Oliv.* *Marsh.*

Frequents the flowers of the hawthorn and other plants, not common. May—June.

FAM. CANTHARIDÆ.

Gen. PROSCARABÆUS.

P. vulgaris, *Steph.* *Meloë proscarabæus*, Linn. Marsh.

Borders of fields, gardens, road sides, &c., occasional. Canaan Lane. Water-of-Leith, opposite St Bernard's Well. JAMES WILSON, Esq. This insect was remarkably abundant in the Botanic Garden in the spring of 1829. April, May.

FAM. NOTOXIDÆ.

Gen. ANTHICUS.

A. fuscus, *Steph.* *Lytta fusca*, Marsh.

A single specimen of this insect was taken last July among the grass at Figget Whins. In England it is usually found on the flowers of umbelliferous plants.

SECTIO VI.

SUB.-SEC. BRACHELYTRA.

FAM. TACHYPORIDÆ.

Gen. DRUSILLA.

D. canaliculata, *Leach.* *Staph. canaliculatus*, Fab. Marsh.

Under stones in damp woods, not very common. Wood at Craiglockhart. Collinton woods. May.

Gen. ALEOCHARA.

A. fuscipes, *Grav.* *Staph. fuscipes*, Payk. Marsh.

Not a scarce insect, on wall tops near stables and cow pastures. Walls round Edinburgh, and on highways. April—July.

A. limbata, *Grav.* *Staph. limbatus*, Payk. Marsh.

Under stones in woods and fields, not scarce in the spring.

Numerous other minute Aleocharæ occur near Edinburgh, but the species have not been determined.

Gen. Megacronus.

M. analis, *Steph.* *Staph. analis*, Fab. Marsh.

Beneath stones, not uncommon in some places. Blackford Hill. Woods at Dreghorn, &c.

Gen. Ischnosoma.

I. punctato-striatus, *Steph.*

Under stones, not very common.

Gen. Bolitobius.

B. lunulatus, *Steph.* *Staph. lunulatus*, Linn. Marsh.

Inhabits decaying Agarici and Boleti in woods, and is rather common. Cramond. Woods on the banks of the river Almond, &c. June—September.

Gen. Tachyporus.

T. chrysomelinus, *Grav.* *Staph. chrysomelinus*, Linn. Marsh.

Under stones, among moss, at the roots of grass, and occasionally on flowers, pretty frequent. King's Park. Blackford Hill. Figget Whins, among the matted roots of the Sea-reed. March—September.

T. marginellus, *Steph.*

Under stones not unfrequent.

T. analis, *Grav.* *Oxyporus analis*, Fab. Panz.

Usually found, like the other species, under stones, but it is not common. Craiglockhart. Sand banks by the sea shore at the roots of the herbage. May—August.

T. marginatus, *Grav.*

An exceedingly abundant species under stones, among moss, &c. It occurs everywhere around Edinburgh, and is particularly plentiful in the King's Park. March—November.

T. hypnorum, *Steph.* *Staph. hypnorum*, Fab. Marsh.

Stewart's List. It is not unlikely that some of the foregoing species have been mistaken for this insect.

Gen. Cypha.

C. rufipes, *Kirby.* *Tach. granulum.* *Scaph. acuminatum*, Marsh.

This insect has been but seldom observed near Edinburgh, having probably been often overlooked, owing to its small size and obscure colour. Marshy meadow between Restalrig and the sea. June.

Gen. Conurus.

C. obscuripennis, *Steph.*

Very rare. Among the roots of the sea-reed on the sand-bank facing the sea at Figget Whins. July.

Gen. Tachinus.

T. collaris, *Grav.*

Grassy banks by the sea, not common.

T. marginellus, *Grav.* *Staph. marginatus*, Don.

With the preceding species, but not very common.

T. rufipes, *Grav.* *Staph. rufipes*, Linn. Marsh.

Very frequent under stones, &c., on road-sides, pastures, &c.

T. subterraneus, *Grav.* *Staph. subterraneus*, Linn. Marsh.

Occasional on wall-tops and putrid vegetables. Walls near Ravelston, and to the west of Edinburgh, frequent in March. Cramond Bridge, &c.

Fam. STAPHYLINIDÆ.

Gen. Creophilus.

C. maxillosus, *Kirby*. *Staph. maxillosus*, Linn. Marsh.

Plentiful on carcasses, especially on the sea-shore. It is dissimilar in its habits to the other insects of the family that resemble it in size. It is seldom seen preying on other insects, but usually feeds on the dead bodies of the larger animals, in company with the Silphidæ and Nitidulæ. When disturbed it coils itself up and remains quite inactive, unlike most of the other Staphylinidæ, which are so remarkable for their threatening attitude.

Gen. Staphylinus.

S. murinus, *Linn. Marsh.*

Stewart's List. Wern. Mem. vol. i.

S. pubescens, Fab. Marsh.

On old walls, pathways, &c., occasional. Near Merchiston Castle. Loanhead. Cramond. April—August.

S. erythropterus, *Linn. Marsh.*

This insect has been taken near Edinburgh, but it is very scarce.

S. castanopterus, *Grav. Staph. erythropterus*, var. *minor*, Oliv.

Found not unfrequently under stones, and by the sides of highways. The neck, scutellum, and upper surface of the abdominal segments, are often concolorous with the rest of the body, but individuals are occasionally met with having some, or all of these parts, covered with a sericeous pubescence of a bright yellow colour.

S. æneocephalus, *Payk. Staph. sericeus*, Marsh.

Frequent. Beneath stones in the King's Park. Braid Hill.

Gen. Goërius.

G. olens, *Steph.* *Staph. olens*, Fab. Marsh.

The largest and most formidable looking of the Staphylinidæ that are to be found in this quarter. It is rather common, particularly in spring and autumn. Salisbury Craigs and Arthur's Seat. Canonmills. Under stones in waste places.

Gen. Ocypus.

O. similis, *Steph.* *Staph. similis*, Oliv.

Under stones, not scarce. Salisbury Craigs and elsewhere.

O. brunnipes, *Steph.* *Staph. brunnipes*, Oliv. Marsh.

Of common occurrence under stones, during spring and summer. Salisbury Craigs. Braid Hill. Corstorphine, &c.

Gen. Quedius.

Q. tristis, *Steph.* *Staph. tristis*, Grav. *Staph. dilatatus*, Marsh.

Common. It was called *dilatatus* by Marsham, owing to the dilatation of the anterior tarsi. The colour of the upper surface varies considerably in different individuals. Salisbury Craigs. Arthur's Seat. Braid Hill. April—August.

Q. picipennis, *Steph.* *Staph. picipennis*, Payk. *Staph. molochinus*, Grav.

Of pretty frequent occurrence.

Q. impressus, *Steph.* *Staph. impressus*, Grav. *Staph. marginellus*, Marsh.

Frequent on wall-tops near stables, appearing, when the weather is warm, as early as the middle of March. Road sides west of Edinburgh, &c.

Q. suturalis, *Steph.* *Staph. suturalis*, Marsh. *Staph. discoideus*, Grav.

In such places as the foregoing, but not so frequent. May—August.

Gen. PHILONTHUS.

P. laminatus, *Steph.* *Staph. laminatus*, Creutz.

Not scarce under stones and among grass. Salisbury Craigs, &c. April—August.

P. splendens, *Steph.* *Stuph. splendens*, Fab. Samou.

Under stones in the King's Park and elsewhere, not scarce.

P. politus, *Steph.* *Staph. politus*, Linn. Marsh.

STEWART's List. Wern. Mem. vol. i.

P. marginatus, *Steph.* *Staph. marginatus*, Fab. Marsh.

Not common, but found at times with the other species.

P. varians, *Steph.* *Staph. varians*, Oliv. Grav.

Very abundant during spring and summer in the King's Park, and other places.

P. bipustulatus, *Steph.* *Staph. bipustulatus*, Fab. Grav.

Under stones at Salisbury Craigs, in the spring. GRAVENHORST enumerates seven varieties, arising from the different shape and position of the sanguineous mark on the elytra.

P. corruscus, *Steph.* *Staph. corruscus*, Grav. *Staph. nitidus*, Marsh.

This appears to be rather a scarce insect in this neighbourhood; it is occasionally found, however, on highways, and beneath stones.

Gen. RAPHIRUS.

R. attenuatus, *Steph.* *Staph. attenuatus*, Grav.

Beneath stones in moist places. Under sea-weed on the shore at Leith and Portobello, plentiful. May—August.

Gen. OTHIUS.

O. fulgidus, *Steph.* *Staph. fulgidus*, Payk. *Staph. fulminans*, Grav.

Pretty frequent

Gen. GYROHYPNUS.

G. cruentatus, *Kirby.* *Staph. cruentatus*, Marsh.

Frequent under stones. Salisbury Craigs, and places in the neighbourhood. Ravelston. April—August.

G. linearis, *Steph.* *Staph. linearis*, Marsh.

Under stones in moist places, pretty frequent.

G. longiceps, *Steph.* *Staph. longiceps*, Grav.

Among moss in woods, &c., not so common as the two preceding. Corstorphine Hill.

G. angustatus, *Kirby.* *Staph. elongatus β*, Grav.

Not common. Several other species of this genus have been taken near Edinburgh, but their names have not been ascertained.

FAM. STENIDÆ.

Gen. SUNIUS.

S. angustatus, *Steph.* *Staph. angustatus*, Fab. Marsh. Don.

This delicate insect, which is the only species of the genus that has been observed here, is by no means common. It has been taken in the month of May under stones in the park at Duddingston House, and at Salisbury Craigs.

Gen. RUGILUS.

R. orbiculatus, *Curtis.* *Staph. orbiculatus*, Marsh.

Under stones on the Sea-shore west of Newhaven, and elsewhere. Water-of-Leith. March—July.

Gen. PÆDERUS.

P. riparius, *Fab.* *Staph. riparius*, Linn. Marsh.

On banks by the sides of rivers, under stones, and amongst grass; but is far from common. April, May.

Gen. STENUS.

S. brunnipes, *Kirby.*

"The Stenii," says Mr CURTIS, "are found at all seasons in damp situations, upon moist banks, sides of rivers and ditches, under stones, and upon aquatic plants." The S. brunnipes is not the most common in this neighbourhood, but it occurs occasionally at the roots of hedges, &c. Near Duddingston.

S. unicolor, *Kirby.*

Pretty frequent in the spring under stones by the side of the Water-of-Leith, and in numerous other situations.

S. gracilis, *Steph.*

Not very plentiful. Under moss and at the roots of plants. Figget Whins, &c.

S. gonymelas, *Kirby.*

In such situations as the last, and rather more frequent.

S. Juncorum, *Leach.*

Moist banks and aquatic plants. Among the reeds at Duddingston Loch. Pond, Botanic Garden.

S. lineatulus, *Kirby.*

With the preceding, not very rare.

Gen. DIANOÜS.

D. rugulosus, *Leach.* *Dia. cœrulescens*, Curtis, iii. pl. 107.

This insect was first discovered by Dr LEACH, who met with it upon the banks of the Esk near Rosslyn Castle. It is very local in this country.

Gen. OXYTELUS.

O. morsitans, *Grav.* *Staph. morsitans*, Payk. Marsh.

This and the following members of the genus are found in great numbers in the warm days of spring, on stones and wall tops, and perched on blades of grass, in the vicinity of stables and cow-pastures. They are so difficult to distinguish, owing to the smallness of their size, and uniformity of colour and sculpture, that many which inhabit this district may have escaped observation. The present species is one of the most common. Road sides near Craiglockhart. Libberton. Meadows at Restalrig, &c. &c.

O. sulcatus, *Steph.*

With the preceding, not scarce.

O. rugosus, *Kirby.* *Staph. rugosus*, Fab. Marsh.

Frequent. The elytra are sometimes rufous. Banks of the Water-of-Leith a little above Dean House, under stones, very plentiful. March.

O. nitens, *Steph.*

Not so common as some of the preceding. Figget Whins. Roads about Duddingston.

O. piceus, *Grav.* *Staph. piceus*, Linn. Marsh.

Occasionally found under stones and in pastures. King's Park. Wall tops near Lochend.

O. pallipes, *Kirby.*

A minute species, seemingly not rare.

O. angustatus, *Kirby.*

Not easily distinguished from the last, in company with which it may sometimes be found.

O. opacus, *Kirby.*

Pretty common

Fam. OMALIDÆ.

Gen. Evæsthetus.

E. nigro-æneus, *Kirby*. *Syntomium nigro-æneum*, Curtis.

This species was discovered by the Rev. Mr Kirby, and having been taken but seldom since, it is a desideratum to most of the English collections. It is probable that it is not very scarce in Scotland, but it is difficult to detect, as it is rather minute, and usually concealed among moss. It was found last May on the wall at the bottom of the rock at Craiglockhart. It has likewise occurred oftener than once at Raehills, Dumfries-shire.

Gen. Proteinus.

P. brachypterus, *Latr*. *Omalium ovatum*, Grav.

On the flowers of the hawthorn in May, near Slateford. It is not common.

Gen. Anthobium.

A. Sorbi, *Steph*. *Omalium Sorbi*, Gyllen.

On the flowers of plants. On the flowers of the hawthorn at Slateford. On the flowers of the broom by the side of the canal, near the bridge No. 8., very abundant. June, July.

A. grossum, *Steph*. *Omalium grossum*, Kirby.

A few specimens of this insect have been taken among grass at Inveresk. It occurs both in Roxburghshire and Dumfries-shire.

Gen. Elonium..

E. striatulum, *Steph*. *Staph. striatulus*, Fab.

Met with in such situations as the Oxyteli, but it is not frequent in its occurrence. Pathways and road sides near Craigmillar Castle.

Gen. Omalium.

O. florale, *Steph.* *Staph. floralis,* Payk.

Common on wall tops in company with Oxyteli and Aleocharæ. It may be found in that situation in mild weather even in the middle of winter.

O. rivulare, *Grav.* *Staph. rivularis,* Payk. Marsh.

With the last plentiful. Walls by the side of the Water-of-Leith. Sea-shore at Newhaven. March—November.

Gen. Lesteva.

L. obscura, *Samou.* *Carabus staphylinoides,* Marsh.

Under stones and weeds in moist places, sometimes even under water. Ditch by the road side at the west end of Braid Hill, in considerable plenty, last May.

The handsome and rare species *L. Leachii,* so admirably figured by Mr Curtis, Brit. Ent. pl. 303, has been taken several times at Raehills, Dumfries-shire.

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XXIV.—*Remarks on the Phenogamic Vegetation of the River Dee, in Aberdeenshire.*

By William Macgillivray, A. M.

(*Read 2d April* 1831.)

Whatever light may have been thrown on the geographical distribution of plants, by the botanists of continental Europe, in our island the cultivation of descriptive botany seems to have excluded the other branches of the science, and the utmost extent of our knowledge of the distribution of species is limited to a few particular remarks accompanying the description of specific forms in our lists or floras. The time must no doubt come, when a different system will prevail : but in the mean time, an attempt to describe the vegetation of a particular natural district, may excite persons better qualified than I profess to be, to present detached pictures of the vegetation of Scotland, from which a complete panorama may ultimately be constructed.

The principal sources of the Dee are found in that part of the district of Braemar which is contiguous with Badenoch, and the north-eastern extremity of Perthshire, in the midst of the Grampians, and nearly in the centre of Scotland. The two principal branches, which unite about three miles above the Linn, to form what is properly called the

Dee, may be traced, the one to the summit of Ben Vrotan, the other to a hill about half way between Castletown of Braemar and Blair of Atholl, but more to the north-east than the central point of a line drawn between these two places. The latter of these streams, named the Geonly, is somewhat tinged with the brown colour which the rivers and lakes of peaty districts commonly assume; but that from Ben Vrotan and Glen Dee is pure and limpid, which is the case with all the other streams from the glens opening on the north side of the valley of the Dee, as far as Castletown. The mountains of Braemar being granitic, and but thinly covered with soil, their streamlets are clear, and the Dee passing in the whole of its course through a country covered with granitic diluvium, and but scantily supplied with coloured alluvium or soil, preserves this clearness throughout. Its whole course is about 75 miles.

The Dee is decidedly alpine in the upper half of its course; and from the sterility of the neighbouring country, the absence of mud in its bed, and the rapidity of its current, it manifests much of this character all along, several of the alpine plants being found on its pebbly beaches, even as low as within three miles of its mouth. It has no falls in its course, excepting that of the Linn, in Braemar, which is produced by the narrowness of its channel at this place, apparently an irregular crack in the mica-slate, rather than by a sudden alteration in the altitude of its bed. A few rapids occur, such as those below Invercauld, and at the Bridge of Pitarch. It has, however, no muddy pools of any extent, but uniformly flows with a rapid stream, more or less rippled as the bed happens to vary from pebbly to rocky.

From its source to the Pass of Tulloch, 38 miles from Aberdeen, the Dee flows in a narrow, and but slightly tortuous valley, bounded on both sides by mountains of moderate elevation. From this to Upper Banchory, 20 miles farther, its course is over an irregular plain, with hills at a considerable distance. The mountains converge again at Banchory; and from thence to the sea the river is bounded by hills and rising grounds of less elevation.

The description of the Flora of a river might be commenced at either of its extremities; but the Dee having so much of an alpine character, it will be more convenient to begin with the alpine part of the vegetation, and trace it as it mingles with that of the valleys, and latterly of the sea-coast.

A magnificent, but sterile and desolate range of granite mountains, stretches from Ben Vrotan to the Pass of Tulloch, forming the most elevated ground in Scotland, and containing several of its highest summits, as Ben-na-muic-dui, which is about the height of Ben-nevis, Ben-na-buird, and Ben-avain. On the rounded summits of these huge masses, covered with fragments of disintegrated granite, gravel, and sand, we find in the highest situation, *Salix herbacea*, *Luzula spicata*, *Gnaphalium supinum*, *Festuca vivipara*, *Juncus trifidus*, *Carex rigida*, *Silene acaulis*, and *Statice Armeria*. *Luzula arcuata* has been found on the summit of Ben-na-muic-dui, by Drs Greville and Graham. These plants always occupy the highest parts, and are almost the only phenogamic ones that occur on the summits of Ben Vrotan and Ben-na-buird, where a kind of sward is formed by the *Juncus trifidus*. Such is the depressing nature of this elevated situation, that *Statice Armeria* is generally not higher than from 2 to 3 inches, *Salix herbacea* is scarcely elevated an inch above the ground, and *Silene acaulis* very little more. The highest mountains in Scotland do not reach the snow line, and though this situation is central, and some of the mountains upwards of 4000 feet high, the snow lies only in small patches in a few places, where it continues throughout the year, unless the season be unusually warm.

From a little below the summits of the highest mountains to a height of about 3500 feet, the more common plants are *Salix herbacea*, and *Juncus triglumis*, very abundant, and in their true native place, *Polygonum viviparum*, *Aira alpina*, *Festuca vivipara*, *Hieracium Halleri*, *Apargia Taraxici*, which is only an alpine variety of *A. autumnalis*. *Luzula spicata*, *Phleum alpinum*, seen only on Ben-nabuird, *Silene maritima*, seen only on Ben Vrotan, and *Azalea procumbens*, besides the plants of the highest elevation, and those of lower situations which ascend thus high; for alpine plants do not occupy very distinct zones, their limits being too much influenced by circumstances to be defined with precision.

Farther down, to the height of about 3000 feet, the plants are of the following species:—and here it becomes necessary to arrange them under three divisions. 1*st*, Those peculiar to the situation, being in their true native place: *Saxifraga nivalis*, *Cerastium alpinum*, *Rhodiola rosea*, the latter generally of small size compared with its state when on the sea-shore; *Alchemilla alpina*, perfect about the height of 3000 feet, and disappearing lower down in dry places, though along the rivulets exceedingly common in the lowest valleys; *Cochlearia officinalis*, of rather rare occurrence; *Oxyria reniformis*, *Saxifraga oppositifolia*, *Aira alpina*, *Veronica alpina*, *Veronica humifusa*, and *Phleum alpinum*. 2*dly*, Those of the higher regions, all of which, excepting *Statice Armeria*, *Salix herbacea*, and *Silene acaulis*, grow here also. 3*dly*, Those of the lower regions which ascend thus high, of which the most general are the following: *Vaccinium myrtillus*, very stunted and without fruit; *Juniperus alpina*, whose true place is much lower; *Empetrum nigrum*, rare and without fruit; *Galium saxatile, Aira flexuosa, Polygala vulgaris, Geum rivale, Rubus Chamæmorus, Pinguicula vulgaris, Tormentilla officinalis, Gnaphalium dioicum, Luzula campestris, Ranunculus acris*, much diminished in size, and with fewer flowers; *Euphrasia officinalis*, and *Anthoxanthum odoratum.*

By the rivulets of this region, the following plants are the most characteristic: *Saxifraga stellaris, S. oppositifolia, Epilobium alpinum, Alchemilla alpina, Gnaphalium supinum, Veronica humifusa, V. alpina, Stellaria cerastioides, Poa alpina.*

Farther down, we find *Thalictrum alpinum*, in its true place. *Aira flexuosa* grows in tufts, and of large size. *Alchemilla alpina* begins to disappear in dry places. *Oxyria reniformis*, which above is small, grows here among the rocks to its greatest size. *Saxifraga stellaris* is still abundant along the streamlets, as well as *Alchemilla alpina* and *Epilobium alpinum.*

The plants of lower situations which have straggled to this region are: *Calluna vulgaris*, which indeed is found higher, but extremely stunted, and in general flowerless; *Vaccinium Myrtillus*, still fruitless; *Vaccinium oliginosum*, occasionally; *Melica cærulea*, of small size; *Agrostis vulgaris, Nardus stricta, Viola canina* occasionally; *Galium saxatile, Sagina procumbens, Campanula rotundifolia, Rumex Acetosella, Eriophorum angustifolium, Cornus suecica, Carex binervis, C. pilulifera, C. panicea, Juncus squarrosus, Scirpus cæspitosus*, and many other species.

Farther down, where the mountains expand, we meet the plants common on the heaths of the central districts. *Juniperus alpina* is plentiful in many places; yet even here *Vaccinium Myrtillus* seldom bears fruit. *Arbutus Uva-ursi* makes its first appearance, together with *Erica tetralix*, *Aira caryophyllæa*, *Vaccinium Vitis-idæa*, *Narthecium ossifragum*, and *Drosera rotundifolia*.

The streamlets of this region afford *Gnaphalium supinum* in abundance and perfection; *Epilobium alpinum*, *Alchemilla alpina*, and a few other plants common in streams, such as *Stellaria uliginosa;* and here commences *Saxifraga aizoides*, which we find extending far below.

In the lateral valleys below this elevation, which are more or less inclined to a right angle with the valley of the Dee, the rivulets produce the following plants: *Alchemilla alpina*, *Alchemilla vulgaris*, *Juncus conglomeratus*, *Ranunculus Flammula*, *Caltha palustris*, *Epilobium parviflorum*. In their vicinity we find those plants of the lower situations which ascend highest, such as *Gnaphalium dioicum*, *Rubus saxatilis*, *Scabiosa succisa*, *Lotus corniculatus*, *Anthyllis vulneraria*, *Hypericum pulchrum*, *Polygala vulgaris*, *Solidago virgaurea*, and occasionally *Tussilago Farfara* and *Digitalis purpurea*.

The general aspect, however, as in most of the other uncultivated parts of Scotland, is heathy, *Calluna vulgaris* being the predominant plant, and next to it *Erica cinerea*, while *E. tetralix* occurs here and there in moist places. As in other parts similarly situated, we find among this heath, *Empetrum nigrum*, whose berries here attain a much larger size than in lower situations, *Vaccinium Myrtillus* and *V. Vitis-idæa*, the latter in its proper place. *Rubus Chamæmorus* is of not unfrequent occurrence, which is also to be said of *Arbutus Uva-ursi*, *Myrica Gale*, and *Genista anglica*. *Parnassia palustris*, *Pinguicula vulgaris*, *Orchis maculata*, *Pedicularis sylvatica*, *Drosera rotundifolia*, *Narthecium ossifragum*, *Triglochin palustre*, *Scirpus cæpitosus*, *Nardus stricta*, *Juncus bufonius*, *J. squarrosus*, *Eriophorum vaginatum*, *Carex stellata*, *ovalis*, *pauciflora*, and others, together with a multitude of plants which occur in lower situations, are found in oozy ground. In dry places, *Hypericum pulchrum*, *Hypochæris radicata*, *Cistus Helianthemum*, *Thymus Serpyllum*, *Cnicus lanceolatus*, *Achillæa Millefolium*, *Genista anglica*, are observed, together with many of the plants common on the lower heaths, for here the aspect of the vegetation is no longer alpine.

In those valleys, there appears to have been much wood at a former period, consisting principally of *Pinus sylvestris*. At present there is scarcely any, and the little that is grows along the streams. It consists of *Populus tremula*, *Betula alba*, *Pyrus aucuparia*, these being the trees that in Scotland approach nearest the alpine region. *Betula nana* grows here and there, on the sides of the hills, but is not common.

Leaving the majestic solitudes of the central Grampians, where grandeur and sterility preside, and where few traces of animation are discovered, we enter the valley of the Dee, which, extending from Dubrach to Invercauld, presents a beautiful specimen of Highland scenery. Here we find the plants principally consisting of those which form the great mass of vegetation common to all parts of Scotland. Of these it is sufficient to mention only a few.

About the Linn, and along the sides of the hills, *Anthoxanthum odoratum* and *Juncus bufonius* are viviparous. The meadows are in some places covered with the beautiful *Cnicus heterophyllus*. *Saxifraga aizoides* is very abundant, growing by the streams along with *Oxyria reniformis*, *Alchemilla alpina*, and *Galium boreale*. *Ligusticum Meum* and *Rubus saxatilis* commence about Castletown, and continue much farther down, as does the *Cnicus heterophyllus*, and many of the other subalpine plants, for the vicinity of the mountains renders the whole country similar in this respect as far as Ballater. Of the other plants common in the lower alpine valleys of Scotland, the following are some of those observed.

In pasture grounds: *Bellis perennis, Senecio Jacobæa, Apargia autumnalis, Plantago lanceolata, P. media, Achillea Millefolium, Prunella vulgaris, Gentiana campestris, Galium verum, Scabiosa succisa, Campanula rotundifolia, Centaurea nigra, Viola canina, Pimpinella saxifraga, Lotus corniculatus, Ranunculus acris, R. repens, Linum catharticum, Trifolium medium, T. repens, Spiræa Ulmaria, Anthyllis vulneraria, Galium saxatile, Cnicus lanceolatus, Hieracium Pilosella, Agrostis vulgaris, A. canina, Lolium perenne, Briza media, Poa annua, P. decumbens, Aira cristata, A. flexuosa, Festuca ovina, F. pratensis, Cynosurus cristatus, Phleum pratense, Anthoxanthum odoratum, Avena pubescens, Angelica sylvestris, Gnaphalium germanicum, G. dioicum, Cardamine pratensis, Orobus tuberosus, Viola lutea,* purple variety, *Thymus Serpyllum, Veronica Chamædrys.*

In open moist places: *Parnassia palustris* occasionally, *Galium palustre, Juncus effusus, Rhinanthus Crista-galli, Ranunculus Flammula, Cnicus palustris, Pedicularis palustris, Eriophorum angustifolium,* &c.

In the shade of woods, that is, along the rivulets, whose banks are always wooded at the mouths of the valleys: *Anemone nemorosa, Primula vulgaris, Geranium sylvaticum, Trifolium medium, Epilobium montanum, Asperula odorata, Trollius europæus, Valeriana officinialis, Hieracium sabaudum, H. sylvaticum, Oxalis Acetosella, Spiræa Ulmaria, Stellaria Holostea, Geum urbanum, Solidago Virgaurea, Teucrium Scorodonia, Mercurialis perennis, Aira cæspitosa, Chrysosplenium alternifolium.*

By the rivulets, in open places: *Galium boreale, Achillæa Ptarmica, Geum rivale, Tussilago Farfara,* and others, together with the other alpine plants mentioned as occurring in such places.

In cultivated fields are seen the plants usually found in such places in all parts of Scotland. *Centaurea Cyanus* and *Chrysanthemum segetum* are particularly abundant in the whole course of the Dee. In short, the plants which form the basis of vegetation in Scotland, are those which occur here, extending along the course of the river to its mouth. The river itself, being rapid and pebbly in its bed, is not favourable to aquatic plants. *Potamogeton natans, Scirpus lacustris, Carex riparia, Sparganium natans, Myriophyllum spicatum*, and such plants, occur in small quantities.

Epilobium angustifolium is abundant in the den of a rivulet about half way between Castletown and the Linn. It also occurs in Glen Candlic, near Invercauld, and in other places. *Trifolium medium* is of great size and beauty, and seems to have entirely usurped the place of *T. pratense*, as I did not observe a single specimen of the latter.

The wood of this valley is composed principally of *Pinus sylvestris*, of which there is a considerable quantity undoubtedly wild, although there is also much that has been planted. Many of the trees in the wood above Mar Lodge are of great size and beauty. One which I measured was 11 feet 8 inches, two feet above the ground, and I saw several others of greater circumference. Woods of *Betula alba* also occur; and by the streams *Alnus glutinosa, Pyrus aucuparia, Populus tremula, Corylus Avellana, Prunus Padus. Fraxinus excelsior* I have nowhere seen above Castletown, and the gardener at Invercauld informed me that when planted, the young twigs are liable to be destroyed in winter. *Lonicera Periclymenum* occurs in the woods, but is not frequent, as do *Rubus idæus* and *R. corylifolius*, and there is abundance of *Vaccinium Myrtillus* and *V. Vitis-idæa.* The willows which I observed were, *Salix cinerea*, *S. prunifolia*, abundant and of large size, *S. aurita*, *S. repens*, together with some others, of which I am not certain. The roses were, *Rosa spinosissima*, *R. canina*, several varieties, *R. villosa*, and *R. tomentosa*. In Braemar the Broom and Furze are nowhere to be seen.

As we proceed down the river, the quantity of wood increases. *Betula alba* and *Pinus sylvestris* predominate, and of both there are extensive forests. These trees are the only ones which in Scotland form woods or forests of themselves, to the exclusion of other trees. *Quercus Robur* and *Fraxinus excelsior* begin to appear here and there below Castletown, and in some places form a considerable proportion of the wood. All the species mentioned, together with *Ilex Aquifolium*, are found as far as the pass of Tulloch. In this tract *Trifolium medium* is much more common than *T. pratense*. *Fragaria vesca* abounds in the woods, together with *Vaccinium Myrtillus*. *Hieracium sabaudum*, and *sylvaticum*, are of common occurrence, as well as *Ligusticum scoticum* and *Melampyrum pratense*, and *Myrica Gale* and *Genista anglica* are seen here and there. *Rubus idæus* occurs on the borders of the woods, together with the roses mentioned, and *Juniperus communis* makes its appearance. Of the other plants which occur, the most remarkable are, *Pyrola secunda*, *P. minor*, and *Asperula odorata*. At Abergeldy we have still a mixture of the alpine plants, *Saxifraga aizoides* and *Alchemilla alpina* occurring in abundance. *Cnicus heterophyllus* is also frequent. Near Ballater *Arundo Phragmites* makes its first appearance, but not by the river.

Before proceeding, it will be necessary to extend our examination to a group of mountains occupying the space bounded by the river Dee from Castletown to Ballater, Glen Muic, the loch of that name, and Glen Callader, which opens into Glen Cluny, about two miles from Castletown. The highest summit of this group is Loch-na-gar, which consists of granite, as do the other masses in the vicinity. The eastern side of Glen Callader, on the contrary, consists of gneiss and mica-slate. The granitic mountains to the north of the Dee are scantily clothed with vegetation, owing to the disintegration of the rock, which has covered them with stones and gravel. Loch-na-gar, and especially the mountains around it, being composed of harder rock, have a considerable covering of peat, and a more luxuriant vegetation, although their summits are still exceedingly bare. Glen Callader is still better furnished with vegetation; the rills and streams from the whole of this group are more or less tinged with brown. In Glen Callader there is a lake about a mile in length, in which, among other aquatic plants, I observed *Lobelia Dortmanna*, *Subularia aquatica*, and *Myriophyllum verticillatum.*

The Corry of Loch Ceanndin, at the head of this valley, produces a great number of alpine plants, among which I observed *Veronica alpina*, *Veronica humifusa*, *Alchemilla alpina*, *Sibbaldia procumbens*, *Gnaphalium supinum*, *Saxifraga stellaris*, *S. oppositifolia*, *Poa alpina*, *Festuca vivipara*, *Rhodiola rosea*, *Polygonum viviparum*, *Cerastium latifolium*, *Juncus trifidus*, *Juncus triglumis*, *Poa alpina*, *Saxifraga hypnoides*, *Salix herbacea*, *Luzula spicata*, *Salix Stuartiana*, and a supposed new species which I have named *Salix Macnabiana.* The alpine variety of *Ranunculus acris* is here very abundant, and *Geranium sylvaticum* and *Trollius europæus* grow on the rocks.

In crossing the mountains from Loch Callader to the head of Loch Muic, I found the same plants generally as those which occur to the north of the Dee. The Duloch, between the Craigs of that name, is entirely destitute of vegetation. Loch Muic itself is scantily supplied, although it swarms with small trouts. On Loch-na-gar, and more especially in its corry, the rocks of which are from 300 to 800 feet in height, I observed the following species: *Alchemilla alpina, Apargia Taraxici, Salix herbacea, Juncus trifidus, Gnaphalium supinum, Aira alpina, Festuca vivipara, Rubus Chamæmorus, Aira alpina, Cerastium latifolium, Saxifraga stellaris, Veronica alpina, Veronica humifusu, Rhodiola rosea, Epilobium alpinum, E. alsinifolium, Sibbaldia procumbens, Hieracium Halleri, Cochlearia officinalis, Oxyria reniformis, Vaccinium uliginosum. Saxifraga nivalis* and *S. rivularis* were found there by Dr Bainbridge in 1824. A hieracium corresponding precisely to the descriptions of *H. villosum* in Fl. Brit. and Engl. Flora occurs among the rocks of Loch-na-gar and other mountains in the vicinity. It has no affinity to *H. Halleri*, but is probably an alpine variety of *H. murorum* or *maculatum*.

Among these plants, and extending to within 600 feet of the summit of the mountain, occur many others, which, commencing at the sea, shew themselves in all intermediate situations, where they find soil and shelter suited to their nature. The following list comprehends nearly all the plants of this description which I have observed on either side of the Dee, extending to a height of about 3500 feet:

Cerastium viscosum, Euphrasia officinalis, Alchemilla vulgaris, Pinguicula vulgaris, Rumex acetosa, R. acetosella, Lychnis dioica, Caltha palustris, Trollius europæus, Anthoxanthum odoratum, Tormentilla officinalis, Rhinanthus Crista-galli, Hieracium murorum, Hieracium sylvaticum, Stellaria uliginosa, Polygala vulgaris, Geum rivale, Gnaphalium dioicum, Ranunculus acris. If *Festuca vivipara; Veronica humifusa* and *Apargia Taraxici* are merely varieties; *Festuca ovina, Veronica serpyllifolia* and *Apargia autumnalis* may be added to the list. The changes which these plants exhibit at their highest elevation are the following. *Caltha palustris* has its crenatures lengthened and sharpened, like those of *C. radicans; Ranunculus acris* has become more slender and delicate, with fewer flowers; *Euphrasia officinalis* has its flowers larger, and more deeply coloured; *Hieracium murorum* and *H. sylvaticum*, have broader and shorter leaves, shorter stems, and fewer flowers; and *Lychnis dioica* has become very shaggy. The other plants do not exhibit any very remarkable difference.

Several rare alpine plants, besides those mentioned, have been lately found by Dr Graham and others among the Braemar mountains. These I omit mentioning, lest I should unnecessarily interfere with discoveries, which their authors may find it more agreeable to communicate to the public in their own words.

The granitic mountains of the Dee, although rounded and massy in their general form, frequently present magnificent ranges of precipices, most of which have a semicircular form. The slopes of debris, consisting of fragments of all sizes, from a diameter of several yards to the finest sand, form these semicircular cliffs into hollows, which by the natives are named corries (*correi*, in Gaelic, signifying a kettle), and which always contain a small and apparently very deep lake. It is at the base, in the ravines and fissures, and on the shelves of these rocks, and along the streamlets which descend from them, that the alpine plants are to be found in the greatest profusion and luxuriance.

The streams from the Loch-na-gar group all run into the Dee, principally by the River Muic, on which there is a fine fall, about five miles from Ballater. Another fall at the head of Loch Muic, in the savage glen of the Duloch, is also worthy of being visited.

Splendid specimens of *Viola lutea* occur abundantly in the grassy fields at Spittal of Glen Muic. The flowers are generally of a rich yellow; but individuals occur in which the two upper (or properly lower) petals are tipped with purple, and others in which they are half purple, or entirely so; the lateral petals then become purple also. In Glen Callader, and other parts in Braemar, the purple variety occurs on the heaths. In one or other state it is undoubtedly the original of the *Viola tricolor;* and I have traced the gradations through an extensive series of forms and colours, including all kinds of leaves from cordato-orbicular to linear-lanceolate; calycine segments entire, undulated, and serrate; petals from thrice the length of the calyx to half as long, &c.

Melampyrum sylvaticum, to which I was directed by a friend, grows abundantly in a birch wood on the southern bank of the Dee, nearly opposite to Ballater.

At the Pass of Tulloch we take leave of Highland scenery, and with it for a time of the more interesting features of vegetation, and enter upon an irregular, somewhat circular plain, which continues for upwards of nine miles, passing beyond Charlestown of Aboyne. It is bounded by rather low hills of desolate aspect, and is covered by stunted heath. Next to the *Calluna* and two *Ericæ*, *Arbutus Uva-ursi* and *Myrica Gale* are the most conspicuous and abundant species. *Spartium Scoparium* begins to appear, there being none of it above the pass of Tulloch. *Ulex europæus* also occurs very sparsely. *Rosa canina*, *R. spinosissima*, *R. villosa*, *R. tomentosa*, and one or two other species, are to be seen at the upper end of the valley. Here there is very little natural wood, and scarcely any along the river, till we arrive at Charlestown, where there is some. At this place there are also extensive plantations of pine and other trees, with which we have nothing to do. In one of these woods *Goodyera repens* is said to grow abundantly.

In all this course the Dee flows pretty rapidly along, destitute of vegetation on its banks, differing from the heath of the plain, but still retaining the alpine plants on its pebbly beaches, *Saxifraga aizoides*, *Alchemilla alpina*, *Oxyria reniformis*, together with *Galium boreale*, and *Silene maritima.* Whether the latter species has descended from the Braemar mountains, or has ascended from the sea, like the *Hæmatopus Ostralegus*, which is generally to be seen here, must be left to conjecture. Even within two miles of Charlestown, *Saxifraga aizoides* is found growing by the fountains, as among its native hills.

The sterility of the country continues, although here and there we find marks of cultivation. *Alnus glutinosa* skirts the river occasionally till we reach Kincardine O'Neal. *Spartium scoparium* and *Ulex europæus* become more abundant. Above the bridge of Pitarch there is a wood of *Betula alba*, on the north side of the river, and a few trees of the same on the opposite bank. Here and there the margins of the river continue to show the alpine species so often mentioned.

On the long range of heath between Charlestown of Aboyne and Upper Banchory, the more remarkable plants which occur are the following: *Galium verum*, *Pimpinella saxifraga*, *Linum catharticum*, *Mentha hirsuta*, *Radiola Millegrana*, *Spergula nodosa*, *Parnassia palustris*, *Juniperus communis*, *Aira caryophyllea*, *A. præcox*, *Rumex Acetosella*, *Spiræa Ulmaria*, *Veronica Chamædrys*, *Teucrium Scorodonia*, *Hypericum pulchrum*, *H. humifusum*, *Myrica Gale*, *Menyanthes trifoliata*, *Arbutus Uva-ursi*, *Narthecium ossifragum*, *Gnaphalium dioicum*, *Pinguicula* *vulgaris, Triglochin palustre, Gentiana campestris, Orchis maculata, Hydrocotyle vulgaris, Comarum palustre, Caltha palustris, &c.*

As we approach Banchory, the wood upon the river increases, there being within two miles of it a considerable quantity of *Alnus glutinosa, Betula alba, Fraxinus excelsior, Quercus Robur, Corylus Avellana, Ilex Aquifolium,* and *Prunus spinosa.* At this place the scenery is very beautiful, compared with the dull moors and low rounded hills of the surrounding country; but below it we find the same sterility which characterizes this part of the country. Below Banchory, and in its vicinity, the species just mentioned occur, together with *Prunus Cerasus*, which, however, is perhaps not indigenous here. *Rubus fruticosus, R. Chamæmorus,* and *Vaccinium Vitis-idæa,* scarcely appear below the pass of Tulloch. About sixteen miles from the mouth of the river, *Plantago maritima* is seen here and there by the road; and below this *Statice Armeria* is frequent and luxuriant by the river.

Sterility still predominates, and the river continues to roll along on its bed of pebbles, with a few stunted alders and willows here and there on its banks. In some parts of the parishes of Maryculter and Peterculter, however, there is a good deal of wood; and here *Prunus Padus* is not unfrequent, as well as *Hedera Helix,* which indeed is found occasionally in the whole course below the Linn of Dee. On the pebbly beaches here the alpine plants still occur, excepting *Galium boreale* and *Saxifraga stellaris. Statice Armeria* attains here a much larger size than on the seashore; and *Oxyria reniformis* more than doubles its original alpine dimensions. The Corbyden in Maryculter is one of the few places in the country remarkable for the collocation of interesting plants. It furnishes, in particular, *Paris quadrifolia, Trollius europæus, Asperula odorata,* *Ranunculus auricomus* and *Sanicula europæa*, and is a favourite resort of the few botanophilists of the neighbouring city, whose enthusiasm is such as not to be overcome by a walk of half-a-dozen miles. Opposite this place is a good deal of *Primula veris*, a rare plant in the north of Scotland, together with *Orchis mascula*; and *Teesdalia nudicaulis* and *Arenaria rubra* are of frequent occurrence. *Fumaria claviculata*, *Leontodon palustre*, and *Trientalis europæa*, are not rare; and on the heaths *Orchis conopsea*, *O. bifolia*, *O. latifolia*, and *O. maculata*, are abundant.

As we approach the Bridge of Dee, sylvan vegetation dwindles away to a few miserable alders, and beyond this there is not even a willow to hide the nakedness of the banks; nor along the remaining part of the river do we find that variety of herbaceous vegetation which occurs in many parts of the surrounding country. The more remarkable plants which are seen below the bridge are, *Alisma Plantago*, *Ranunculus sceleratus*, *Plantago maritima*, *P. coronopus*, and *Cochlearia officinalis*. The last species brings us to the mud of the harbour of Aberdeen.

At the mouth of the river, we have on the one hand an expanse of sandy shore, stretching along the coast for many miles, and on the other a low rocky shore extending southward to Stonehaven. The former presents nothing of peculiar interest. The latter in its coves and clefts affords a considerable variety of the plants peculiar to such situations, among which *Geranium sanguineum* and *Astragalus hypoglottis* are distinguished.

Looking back upon our course, we have the Dee, rapid and clear, flowing in a bed of pebbles, at first enclosed by low rounded eminences, as far as Upper Banchory, where the hills are more elevated, then appearing in a large irregular plain, and expanding into a broad pebbly channel, or wearing its way into the vast heaps of granitic diluvium, of which it often exhibits sections 60 or 80 feet high. Then comes the Pass of Tulloch, by which we enter the truly mountainous district of the river. A long and slightly tortuous valley, bounded by brown, rounded hills, and abundantly wooded with pine and birch, extends to near the sources of the Dee, in search of which we enter the lateral and terminal valleys, destitute of wood, striped with rolled stones and gravel, and ascend the central Grampians, covered with debris, furrowed by rills and torrents, and here and there presenting precipices and corries of great magnificence, in which lie patches of snow, and among which the alpine plants have found a place best fitted for their development. The whole course of the river is comparatively sterile. There are no deep alluvial deposits of clay or mud, nor any extensive fields of rich soil. Heath, pine and birch, are the prevailing plants. Wheat does not thrive even at the mouth of the river. Potatoes, turnips, oats and bigg, are the only plants extensively cultivated. The pastures in the mountainous district are richer than those of the lower part, but they are of small extent, and in the whole course of the river there is not a single hill top or mountain slope covered with verdure. No river in Scotland approaches in its characters to the Dee excepting the Spey, which has a decided resemblance to it.

APPENDIX.

HISTORY

OF THE

SOCIETY.

(*Continued from Vol. V. p.* 583.)

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Robert Bald, Esq. Vice-President, in the chair.—There was read Mr Cormack's History of the Geographical Distribution and Economical Uses of some kinds of Fishes on the banks of Newfoundland, with an account of the great Seal Fishery on that station.—Mr Thomas Buchanan's paper on the Comparative Anatomy of the Organs of Vision and Hearing, illustrated by Drawings, was referred to the following members, as a committee, viz. Dr Barclay, Dr Knox, and Dr Grant.—Dr Robert Knox then read an account of the Anatomy of the Wombat of Flinders.—Dr John Fleming then exhibited a specimen of the Migratory Pigeon of North America, shot in Fife on the 31st of December 1825; and argued, from the perfect state of the plumage, that the animal had not been in confinement, but had probably been wafted across the Atlantic by strong and continued westerly gales. 1826. Jan. 14.

1826. Jan. 28. Professor Graham, Vice-President, in the chair.—There was read Mr Blackadder's account of Highland Alluvium, being the concluding part of his essay on Sand-fields, in which he extended his observations to the summits of primitive mountains.—Professor Jameson then read a communication from a foreign correspondent, on the probability that Meteoric Stones are generated in the atmosphere, and not derived from the moon, nor from any other extramundane source.—The President exhibited specimens of Beryl, which occur, along with rock-crystal, in drusy cavities in the granite of the mountains of Morne in Ireland.

Feb. 11. David Ritchie, D. D. in the chair.—Prof. Jameson communicated a note of Low Temperatures, observed by Mr Grant, at his seat of Rothiemurchus, in the Highlands of Scotland, during the late severe frost of January; the lowest being 6 below 0, and this extreme cold having continued for several hours.—The Professor also gave an account of the occurrence of phosphate of lime, in balls or concretions, in the bituminous shale of the coal formation.—Dr R. E. Grant then read a paper on the structure and nature of the *Spongilla friabilis*, and exhibited recent specimens from the rocks and stakes on the east side of Lochend, near Edinburgh.—There was exhibited to the meeting a collection of magnificent specimens of Doubly Refracting Spar from Iceland, the property of Mr Witham, and collected, last summer, by Mr Rose and Mr Brown, from a great vein, about fourteen feet wide, traversing trap-rock of the nature of amygdaloid.

Feb. 25. Reverend Dr Alexander Brunton, Vice-President, in the chair.—The Secretary read Mr William Scott's Observations on the Climate of Shetland, &c. and laid before the meeting a Meteorological Journal, kept at Unst, by Mr

Scott. He likewise read a notice, communicated by Mr Trevelyan, relative to the numerous Teeth of the Rhinoceros lately discovered in the cave near Kent's Hole, and also regarding the Teeth of an unknown Quadruped found in the same cave.—Professor Jameson then read the first part of a paper, by Professor Esmark of Christiania, entitled, "Remarks tending to explain the Geological Theory of the Earth."

1826. March 11. Robert Bald, Esq. Vice-President, in the chair.—Professor Jameson read the concluding part of Professor Esmark's Observations on the Theory of the Earth.—The Secretary read an extract of a letter from Professor Buckland of Oxford, to Mr Jameson, regarding the lately discovered Cave near Torquay, which has been considered as an antediluvian hyena's den. Specimens of the Bones, supposed to have been gnawed by the hyenas, were exhibited; and several members gave it as their opinion, that these bones had been gnawed by some quadruped; while others remarked, that, in some cases, the erosion in the middle of a bone was so great, that it must have snapped through, had such erosion been produced by forcible gnawing.—The President exhibited to the meeting several large Flower-buds of the *Rafflesia Arnoldi* of Sumatra, with a coloured Engraving representing the Flower when fully expanded.—Dr R. E. Grant then opened a small Mummy-Case in presence of the Society: the case was brought from a catacomb in Upper Egypt, and had one end formed into the resemblance of the head of a cat. A few bones only remained; and Dr Grant was of opinion that they might be those of a small domestic cat.

March 25. Reverend Dr Brunton, Vice-President, in the chair.—There was read a paper by the Rev. Dr Fleming of Flisk, entitled, "The Geological Deluge, as interpreted by Baron Cuvier and Professor Buckland, shewn to be inconsistent with the testimony of Moses and the phenomena of Nature." —Professor Jameson exhibited and gave a general account of several gigantic specimens of the Vase-shaped Sponge, commonly known by the name of Pateræ, or Neptune's Cups; these splendid specimens having been brought from the neighbourhood of the Mauritius.—A very excellent stuffed specimen of the Crocodile of the Nile, 12½ feet long, was also shewn to the meeting.

1826. April 8. Robert Bald, Esq., Vice-President, in the chair.—There was read a notice of a Shower of young Herrings, which fell on the coast of Argyleshire, contained in a letter from the Reverend Colin Smith of Appin to Professor Jameson. —Dr Grant then read an account of a new Zoophyte from the Frith of Forth, forming a genus which connects Spongia and Alcyonium, and which he proposed to call Cliona; the species found on old oyster-shells in our Frith being Cliona celata of Dr Grant.—Mr Stark exhibited four drawers, containing a very complete and beautiful suite of the Varieties of Ostrea opercularis found in the Frith of Forth.—And Mr Bald gave an interesting account of the great Coal-Field of South Wales, and laid before the meeting several very uncommon specimens of Coal, Ironstone, Welch Rock (a sort of micaceous sandstone-flag), and Ore of Titanium.

April 22. David Falconar, Esq., in the chair.—The Secretary read a Memoir on the Arrangement and Nomenclature of Univalve Shells, and on the Structure of the Animals, by Charles Collier, Esq. Staff-surgeon, Ceylon. He also read the introductory part, and gave a general account of an elaborate and learned Monograph of the genus Allium, by Mr George Don, A. L. S.—Professor Jameson then read a communication on the Snakes of Southern Africa, from Dr Andrew Smith, assistant-surgeon 98th Regiment, and superintendant of the South African Museum.

1826. May 27. William Newbigging, Esq. in the chair.—The Secretary read an account of a rare fish, the Sciæna Aquila, taken in the Shetland seas.—Dr Knox read a notice respecting the presence of a Rudimentary Spur in the female Echidna of New Holland.—Dr Grant read an Account of the Motions of the Ova of Campanularia dichotoma, Gorgonia verrucosa, Caryophyllea calycularis, Spongia panicea, papillaris, cristata, and of Plumularia falcata; and stated, that, in all Zoophytes, the motions seemed to be produced by ciliæ distributed over their surface.—There was read at the same meeting an Account, illustrated by coloured drawings, of the Holothuria tubulosa, by Dr Collier, staff-surgeon.

Dec. 2. Reverend Dr Brunton, V. P. in the chair.—At this meeting Professor Jameson read Dr Thomas Latta's Observations regarding the Arctic Sea and Ice, and the intended Expedition of Captain Parry to the North Pole.—Several sheets of the Great Map of the county of Mayo in Ireland, the work of our ingenious and active countryman Mr William Bald, civil engineer, now engraving in Paris, were laid before the meeting; and the excellent execution of the work (done at one half of the London charges) met with universal approbation.—Specimens of the rare Macartney Pheasant, a White Sparrow lately shot in Fifeshire, a specimen of the beautiful Mexican bird called the Quezal, and of the Lama of Peru, were exhibited; and various interesting articles from the Burmese country were shewn and described by Professor Jameson.

1826. Dec. 16. David Falconar, Esq., V. P. in the chair.—The Secretary read Mr Audubon's Account of the Habits of the Vultur Aura, or Turkey-Buzzard, in which he exploded the opinion generally entertained of its extraordinary power of smelling. Mr Audubon being present, afterwards shewed to the Society his mode of fixing recently killed birds in various attitudes, against a board marked with squares or division lines, corresponding to similar lines pencilled on the sheet of paper on which the drawing is to be made.—A specimen of the Swordfish, Xiphias Gladius, seven feet in length, found in the Frith of Forth, and transmitted by Mr Slight, assistant to Robert Stevenson, Esq. civil engineer, was exhibited, and described by Professor Jameson. The Professor also shewed specimens of Jet-coal, the kind used on the Continent for making ornaments, found in Wigtonshire, by Sir Andrew Agnew, Bart. These specimens, he mentioned, were found under peat-moss and above clay, on the property of Sir Andrew Agnew.

1827. Jan. 13. Robert Jameson, Esq. President, in the chair.—Mr Audubon read a Memoir on the Habits of the Alligator, containing much new information regarding that animal.—Dr Grant then read an Account of the Anatomy of the Octopus ventricosus, and exhibited a dissected specimen from the Frith of Forth, of large size, and apparently of full growth.—A stuffed specimen of the Tapir of America was exhibited at this meeting; and the members were then invited by the President to view, in another apartment, some live animals, lately brought from Chile, by the Right Hon. Captain Lord Napier, of the Diamond Frigate, particularly the Felis Puma, or American Lion.

Jan. 27. Professor Graham, V. P. in the chair.—At this meeting Dr Grant read an Account of the Structure of the Eye of the Swordfish, illustrated by a magnified Sketch, and by preserved parts of the eye, taken from the animal lately killed in the Frith of Forth.—The Reverend Dr Scot of Gorstorphine then read a Dissertation on the *Saphan* of the Sacred Writings, proving it to be the Hyrax Syriacus, although rendered 'coney' in our common version.

1827. Feb. 10. Reverend Dr Brunton, V. P. in the chair.—At this meeting the Secretary read a communication from the Reverend William Scoresby of Bridlington, containing Descriptions of some remarkable Rainbows.—Professor Jameson then read Mr William Bald's Geological Survey of Clare Island, on the west coast of Ireland, illustrating the same by Maps and Sections executed by Mr Bald.—The Professor then gave a general descriptive account of a splendid series of the Pheasants and Peacocks of India, specimens of which were placed on the table. A stuffed specimen of a Persian Sheep, presented to the Royal Museum by James Gibson Craig, Esq. was also exhibited.

Feb. 24. Professor Jameson, P. in the chair.—The Secretary read a communication from Mr David Don, on the species of Rheum which affords the rhubarb of commerce. This has been ascertained to be the Rheum Emodi of Dr Roxburgh, the R. australe of the Flora Napalensis.—Mr John James Audubon of Louisiana, being present, read an account of the Natural History of the Rattlesnake (Crotalus horridus), illustrated by a very beautiful drawing of the animal suffering the attacks of mocking-birds.—At this meeting, a series of models of Sailing Vessels of different descriptions, employed in the Chinese Seas, was exhibited and explained by Professor Jameson. These models were wholly the workmanship of native artists, and regarded as very faithful representations.

1827. Mar. 10. Professor Graham, V. P. in the chair.—Dr R. E. Grant read an account of the Paca of Brazil, Coelogenus of M. Frederick Cuvier, and shewed preparations of the most remarkable parts.—The Reverend Dr Scot of Corstorphine then read an essay on the substance called Fine Linen in the Sacred Writings, proving that it must have been cotton cloth.—The Secretary then read a communication from the Reverend W. Scoresby of Liverpool, F. R. S. L. and E., and foreign member of the French Institute, containing some Strictures on Dr Latta's Observations on the Arctic Sea and Ice.—Professor Jameson then read the following communications: 1. A notice, by Mr Trevelyan, regarding the Cockles said to exist in a living state, at a great distance from the sea, in Yorkshire, and which he considered as probably only the Tellina cornea. 2. A short paper by Colonel Silvertop, on the effects likely to be produced on the Lead Trade of Britain, by the great importation of Spanish lead, and proposing to interdict the importation of lead-mine machinery into Gibraltar, from whence it uniformly finds its way into Spain.—The Professor then exhibited and described specimens of Fossil Fishes collected from quarries in Caithness, by Mr Sinclair; and likewise some specimens of the Fossil Fishes of Yorkshire, collected by Mr Witham of Lartington.

Mar. 24. David Falconar, Esq. of Carlourie, V. P. in the chair.—Dr R. E. Grant read a Memoir regarding the Anatomy and Mode of Generation of Flustræ, illustrated by preparations and drawings.—The Doctor likewise read a notice on the Existence of Ciliæ in the young of the Buccinum undatum, Purpura Lapillus, and some other molluscous animals; and also on the Mode of Generation of the Pontobdella muricata of Lamarck.

1827. April 7. Robert Jameson, Esq. P. in the chair.—Mr W. A. Cadell read a Description of the Hindoo Smiths' Bellows, with remarks on the occurrence of a similar bellows in Europe, as illustrative of the Indian origin of the Gypsies.—Mr R. Bald, mining engineer, read Observations on the Coal-field and accompanying Strata in the vicinity of Dalkeith, in Mid-Lothian, and exhibited a section of that coal-field.—The Reverend Dr David Scot of Corstorphine, then read an Essay on the Semamith of Solomon, Prov. xxx. 25, commonly translated 'Spider,' but which he shewed to be a species of Lizard.—At this meeting, Mr James Alexander Vintress exhibited a new Stereometer, or instrument for ascertaining the specific gravity of powders, invented by him.

April 21. The President in the chair.—The Secretary read an account of interesting Works of Art lately discovered in the ruins of Selinus, by two English architects, Messrs Harris and Angel; communicated by Dr Traill of Liverpool. Likewise a notice by James Wilson, Esq. regarding a living specimen of the Puma, or American Lion, lately presented to Professor Jameson.—The Reverend Dr Scot then read a memoir on the Hyssop of the Sacred Writings.—Dr R. E. Grant exhibited several living specimens of the Virgularia juncea of Lamarck, from deep places in the Frith of Forth, and made some remarks on the Structure of this zoophyte.—Professor Jameson then exhibited and described a specimen of the Ibis sacra of Africa, brought home by Major Denham; the Horns of a Wapiti Deer, brought from California by Captain Ferguson; a Balsa, or boat or float, made of two bundles of straw or reeds, used in Peru for crossing rivers, or passing through the surf on the shore; and a specimen of the Peccari Hog, presented to the College Museum by Mr Shenley.

1827. May 19. Reverend Dr Brunton, V. P. in the chair.—At this meeting the following communications were read: 1. An account of experiments on the Magnetic Influences of the Heat produced by the Solar Rays, by Mark Watt, Esq. 2. Notice of a remarkable Marine Animal, probably of the cetaceous tribe, observed in the Mozambique Channel, communicated by Dr Traill of Liverpool, with a drawing. 3. Notice regarding the native country of the Potato (Solanum tuberosum); communicated by Aylmer Bourke Lambert, Esq. 4. Account of the Trachea of the Emu of New Holland, and of the Laryngeal Pouch of the Reindeer, by Dr Traill. 5. Description of a remarkable Aurora borealis, seen at Edinburgh 16th January 1827, by Mr Blackadder. —The Reverend Dr Fleming of Flisk, being present, laid before the meeting some remarks on the genus Scissurella, with a description of a recent British species found by him in Shetland.—A living specimen of the Lemur tardigradus, or Tailless Macauco, brought from China by Mr Baird, was exhibited; and some notes by that gentleman regarding its peculiarities, were read.—A living specimen of the Viverra Mungos, or Mongouste, from Madras, was also exhibited; and some remarks, by Mr Alexander Adie junior, on the habits of the animal since it came into his possession, were read.—Lastly, Specimens of Native Alum from Chile, and of Limestone containing Shells, from the Inca's Bridge, at a very great elevation, sent home by Dr Gillies of Mendoza, were laid before the meeting.

Nov. 24. Major-General Straton, V. P. in the chair.—The Rev. Dr Scot of Corstorphine read a communication, shewing, that the Nitre of the Sacred Scriptures is the same substance as the Natron of the ancient Egyptians, or the Native Soda of modern chemistry.—Professor Jameson then read an account of a new magnetical instrument called the

Solar Compass, invented by Mark Watt, Esq., and exhibited the instrument itself.

1827. Dec. 15. G. A. W. Arnott, Esq. V. P. in the chair.—The Secretary read an account of a peculiar species of Porpesse (Delphinus Peronii ?), which abounds off the coast of Van Diemen's Land; communicated by the Rev. John Macgarvie, A. M.—The next paper was an account of the Climate and of the Geology of the Harris Islands; by Mr William Macgillivray, who resided there for several years.—At the same meeting there was read an account of an Optical Illusion or Mirage, called the Fairy Islands, frequently seen off the north coast of Ireland, near the Skerry Islands of Antrim; communicated by Mr Samuel Thomas Greig. And also, a notice from Lieutenant-General the Hon. Sir Charles Colvile, regarding a fine specimen of Hindoo Sculpture, presented to the University Museum by the General. The specimen was exhibited to the meeting. It represents the goddess Bhowanee, with her usual attendants. It was found among the ruins of a Brahminical temple in the ancient city of Chandwartie, and apparently belongs to a period corresponding to the beginning of the twelfth century of our era.

1828. Jan. 12. David Falconar, Esq. V. P. in the chair.—The Secretary read an account of the Habits of a specimen of the Siren lacertina, which has been kept alive in a hothouse in his garden at Canonmills, near Edinburgh, for more than two years past.—At the same meeting was read a paper by the Reverend John Macgarvie, on the Habits of the large Brown Hornet of New South Wales, with a reference to instinct, and particularly illustrative of its mode of forming its hexagonal cells.—Professor Jameson then exhibited some of the Birds collected by Capt. Parry during his last voyage to the Arctic Regions, two of them (a little Auk and a Guillemot) killed beyond N. Lat. 81°; and specimens of the Rocks of Ross Island, chiefly Gneiss, the most northern known land of the globe.

1828. Jan. 26. Robert Jameson, Esq. P. in the chair.—Dr Grant read the first part of his account of the Anatomy of the Perameles nasuta of Geoffroy, a rare marsupial animal from New Holland.—The Reverend Dr David Scot of Corstorphine then read a memoir on the Emerald of the Ancients.—At the same meeting was read a notice by Mr G. Milroy, regarding the Habits of a living specimen of the Jacchus vulgaris, or Ouistiti, lately brought by him from Bahia; and the specimen was exhibited to the meeting.

Feb. 9. Robert Jameson, Esq. P. in the chair.—The Secretary read a notice respecting the occurrence of a rare bird, the Cursorius isabellinus, or Swiftfoot, in Leicestershire; communicated by Prideaux John Selby, Esq. of Twizel House.—Mr James Stuart Menteath, younger of Closeburn, then read a memoir on the Geology of Nithsdale, chiefly as connected with useful purposes, and contrasted with that of the neighbouring valleys; illustrated by maps and specimens.

Feb. 23. Robert Jameson, Esq. P. in the chair.—There was read a notice regarding a living Ocelot, or Felis Pardalis, from South America, communicated by James Wilson, Esq. The animal was a female, nearly of full size; had been almost two years at Liverpool, and had lately been transferred to the menagerie of the Zoological Society in Regent's Park.—Dr R. E. Grant then read the second part of his account of the Anatomy of the Perameles nasuta of

New South Wales, treating more particularly of the Organs of Generation.

1828. Mar. 8. David Falconar, Esq. V. P. in the chair.—There was read a notice of the Wasting Effects of the Sea, which have exposed a submarine forest on the shores of Cheshire, between the rivers Mersey and Dee, by Robert Stevenson, Esq. civil engineer.—Mr G. A. W. Arnott read two memoirs: 1. On the Mines of the Higher Pyrenees; 2. On the Marbles of the Higher Pyrenees.—The Secretary read a communication from the Reverend John Macvicar, A.M. of St Andrew's, describing a rare fish, the Forked Hake of Pennant, which had been cast ashore near St Andrews in a storm. A drawing of the fish, made by Mr Macvicar, was exhibited to the meeting—Mr Deuchar, lecturer on chemistry, then read a notice of keeping entire the Crystals of Efflorescent and also of Deliquescent Salts, by means of surrounding them with an atmosphere formed from an essential oil, such as oil of turpentine.

Mar. 22. David Falconar, Esq. V. P. in the chair.—The Rev. Dr Scot of Corstorphine read a paper on the Great Fish that swallowed up Jonah, and, after three days and nights, cast him out on dry land; shewing that it could not be a whale, as often supposed, but was probably a Squalus Carcharias, or White Shark.—At this meeting was also read the first part of a memoir on the Lunar Compass, &c. by Mark Watt, Esq.

April 5. Patrick Small Keir, Esq. formerly V. P. in the chair.—Mr Mark Watt read the remainder of his paper on the Lunar Compass.—The Reverend Dr Scot read a memoir on the Shefifon of Moses, Gen. xlix. 17, or the 'Adder' of the English translators.—And the Secretary read a notice by Thomas Johnston, Esq. Hill Top, near Wetherby, of the Great Oak of Cowthorpe, in Yorkshire, illustrated by a drawing.

1828. April 19. Robert Jameson, Esq. P. in the chair.—Mr Blackadder's communication on Polar Lights, illustrated with drawings, was laid before the meeting.—Mr R. Bald, mining-engineer, read a memoir on the Fires that take place in the Collieries of Whitehill and Polton, in Mid-Lothian, and of South Sauchie, in Clackmannanshire.—The Secretary read a notice communicated by Mr Macgillivray, regarding a Cuckoo, which had been kept in a cage since it was taken from a titlark's nest, in the end of July 1827; and the bird was exhibited to the meeting.——D. Falconar, Esq. V. P. having taken the chair, Professor Jameson communicated a notice in regard to the Opaline Wood found in New South Wales, and exhibited a magnificent specimen presented to the Museum by Sir Thomas M. Brisbane, Bart.

June 21. David Falconar, Esq. V. P. in the chair.—The Secretary read a paper by the Rev. William Scoresby of Liverpool, entitled, Remarks on the Probability of reaching the North Pole; being an examination of the recent expedition under Captain Parry, in order to the inquiry how far that experiment affects the practicability of the enterprize.

Nov. 15. The Society met for the session; Robert Stevenson, Esq. formerly V. P. in the chair.—Professor Jameson read a notice regarding the colossal Tusks of the Fossil Elephant, found in an iceberg on the shores of the Arctic coast of America by Captain Beechy; and the tusks themselves were exhibited, having lately been presented to the Museum of the University, by Lord Melville.—There was also read a communication from Mr Blackadder, regarding the junction and mode of formation of the Basalt of the Castle Rock of Edinburgh, and the neighbouring strata, as illustrated by the appearances at present displayed in the new cuts and openings of the strata, in the course of forming the Western Approach.

Henry Witham, Esq. V. P. in the chair.—The Rev. Dr David Scot of Corstorphine read a paper on the Nimur of the ancient Hebrews, translated 'Leopard;' and on the Sis or Swallow of the Hebrew writings, erroneously translated 'Crane' in the English Bible.—Specimens of the Grizzly Bear, of an Animal intermediate between the sheep and the antelope, and also of the new species of Wolf, Fox, and Badger, collected by Captain Franklin and Dr Richardson, during the late expedition to the Arctic countries of North America, were exhibited to the meeting, and were described by Professor Jameson. 1828. Nov. 29.

G. A. Walker Arnott, Esq. V. P. in the chair.—The Secretary read the description of a new Instrument for measuring the different degrees of Magnetic Intensity; communicated by Mark Watt, Esq. Likewise the first part of a paper on the Political and Geological State of the Meywar country, in India; communicated by James Hardie, Esq. Secretary to the Medical and Physical Society of Calcutta.—At this meeting the Rev. J. G. Macvicar exhibited a specimen of the Toothed Gilthead of Pennant, which had been taken alive in the Bay of St Andrew's. Dec. 13.

Henry Witham, V. P. in the chair.—The Rev. J. G. Macvicar read a paper on the Rotatory Motion of Molecules. The object of the author was to shew, that, from the relation which subsists between the two forces, magnetism and electricity, rotation must result in every body com- 1829. Jan. 17.

posed of particles, externally and internally heterogeneous, and also in a homogeneous body in a dissimilar medium. After rotation has been established, then, though the body should be spherical, and there exist no circumstance in its form to determine the direction of its magnetic axis, or axis of symmetry, he endeavoured to shew that this axis is developed in the line of the axis of rotation, which imparts to the body a tendency to move towards another presenting a consecutive pole, or susceptible of such attraction; and that hence a motion of progression, as well as rotation, will be established.

1829. Jan. 31. G. A. Walker Arnott, Esq. V. P. in the chair.—The Secretary read Mr James Wilson's essay on the Origin and Natural History of the Breed of Domestic Dogs; the object of which was to prove that the southern kinds have probably derived their origin from the jackall, and the northern from the wolf.—The Rev. Dr Scot of Corstorphine then read a paper on the Pelican of the Sacred Writings.

Feb. 14. Robert Stevenson, Esq. civil-engineer (formerly V. P.), in the chair.—Professor Jameson read extracts from a paper on the Geology of the Snowdon Range of Mountains, as connected with its Scenery, Soil, and Productions, by James Stuart Menteath, Esq. younger of Closeburn.—The Rev. Dr Scot then read a communication on the Gourd of Jonah, shewing that it was probably the Ricinus Palma Christi, or Castor-oil plant of modern times.—At the same meeting, the Secretary read a notice regarding the Habits of the Ornithorynchus Paradoxus, by Thomas Axford, Esq. of Thorpe, New South Wales; communicated by Mr Robert Neill of Hobart Town, Van Diemen's Land.

Mar. 28. Henry Witham, Esq. V. P. in the chair.—The Secretary read a paper by Dr Fleming of Flisk, on the Insufficiency of the Evidence of a Milder Climate having formerly prevailed in the Arctic Regions.—The Rev. Dr Scot of Corstorphine then read an essay, entitled, The Natural History of the Bee, illustrated from the Sacred Writings.—The Secretary next read a notice contained in a letter from Mr Stuart Menteath, younger of Closeburn, to Prof. Jameson, regarding the Breeding of the Emu of New Holland, at North Cray, near London.—Prof. Jameson read extracts of a letter from Lieutenant Alexander of Chatham to Prof. Wallace, giving an account of a Deposite of Bones of the ancient Ox and Deer, found in a chalk cave.—At this meeting a fine Skeleton of a recent Elk, from Lapland, was exhibited; and the President pointed out the difference between the existing Elk and the Fossil Species found in Ireland and Isle of Man.

1829. April 11. Dr Walter Adam, V. P. in the chair.—Mr Henry Witham read a paper on the Red Sandstone of Scotland, illustrating his remarks by specimens of the New and of the Old Red Sandstone, and shewing that Coal may be found under the former, but cannot be expected under the latter.—The Rev. Dr Scot then read an essay on the Honey of the Land of Canaan.—Mr Mark Watt exhibited and described his Instrument for measuring the different degrees of Solar Magnetic Intensity.—The Secretary read a Report by Mr Robert Spittal and Mr Robert Stevenson jun. relative to the nature of the Impression left on soft clay by the feet of the common pig, both on a horizontal surface and on an inclined plane, proving that the impression is multungulated, not bisulcated.

April 25. Dr Adam, V. P. in the chair.—The Secretary read part of Dr Murray's account of the Botany of the Upper District of Aberdeenshire.—The President then gave an interesting view of the most important observations or discoveries in natural history recently made in different parts of Europe.

1829. Dec. 5. Dr Walter Adam, V. P. in the chair.—Mr Witham of Lartington read a paper on the Vegetation of the First Period of the ancient World, and illustrated it by sketches, and by the exhibition of a number of fine specimens of Stigmariæ and Sigillariæ, chiefly from the Coal-field of Newcastle. In the course of his observations, he likewise gave an account of the very remarkable Stem of a Monocotyledonous Plant found in Craigleith Quarry three ~~years ago~~.—Dr John Gillies then read an account of the extensive Roads or Highways of the ancient Peruvians, still known by the name of Caminos del Inga.—The Rev. Dr Scot then read an essay on the Okrub of the ancient Hebrews, or Scorpion of the English Bible.

1830. Jan. 9. Robert Jameson, Esq. P. in the chair.—The Secretary read a communication by Dr R. K. Greville, on the various economical Uses of Sea Plants; and the Doctor exhibited beautiful dried specimens of the most useful and interesting species.—The Rev. Dr Scot of Corstorphine then read an essay on the Rams and Badgers with the skins of which the Israelites covered the Tabernacle.—Specimens, male and female, of a rare North American Moth (Saturnia Luna), bred in Europe by M. Sömmer of Altona, from imported eggs, were exhibited; and illustrative notes, by Mr James Wilson, were read to the meeting.

Jan. 23. David Falconar, Esq. V. P. in the chair.—There were read to the meeting some notices relative to the Coal found under the marly red sandstone near Leicester, contained in a letter to Henry Witham, Esq., illustrated by sections of the Borings for coal.—Dr John Aitken then exhibited a number of very fine Anatomical Preparations, and gave from them a demonstration of the circulation of the blood in the fœtus, in man, and in several of the lower animals, particularly the cow, the red deer, the dog, and the seal.—The members of the Society afterwards proceeded to Dr Hope's Laboratory, to witness a beautiful experiment, shewing the intense light and heat produced by passing upon an ignited ball of lime, placed in the focus of a lighthouse reflector, a continued stream of hydrogen gas.

1830. Feb. 6. David Falconar, Esq. V. P. in the chair.—The Secretary read a memoir by Mark Watt, Esq. on the Power which certain Spiders possess of fixing their threads horizontally between two perpendicular bodies placed at a distance from each other. Likewise, a notice regarding a sort of Fascination practised on small birds by the Whitret or Weazel; in a letter from the Rev. Alexander Duncan of Mid-Calder.—The Rev. Dr Scot then read an essay on the Dishong of Moses, or Gazelle of the Plain, the 'Pygarg' of the English Bible.

Feb. 20. David Falconar, Esq. V. P. in the chair.—There was read an account of several new species of Grouse recently discovered by Mr David Douglas among the Rocky Mountains, communicated by James Wilson, Esq.; the specimens at the same time being placed on the table.—The Rev. Dr Scot read an essay on the Mustard Plant mentioned in the Gospels, shewing that it was probably the Sinapis nigra, which grows five or six feet high in warm countries, rather than the Phytolacca decandra, which probably did not exist in Judea.

1830. Mar. 6. Henry Witham, Esq. V. P. in the chair.—The Secretary read a notice concerning the Hya-hya or Milk-tree of Demerara, contained in a letter from James Smith, Esq. to Professor Jameson.—After which the Rev. Dr Scot read an essay on the question, Whether domestic poultry were known among the ancient Jews?

Mar. 20. Dr R. K. Greville, V. P. in the chair.—There was read an essay on the origin of our Domestic Poultry, communicated by James Wilson, Esq.; and specimens of several kinds of the Wild Poultry were placed on the table.—The Rev. Dr Scot then read an essay, shewing that the Hyæna of naturalists is most probably alluded to in three different passages of the Sacred Writings, although this has been denied by critics.

April 3. Robert Jameson, Esq. P. in the chair.—There was read by David Craigie, Esq. surgeon, an interesting account of the Internal Structure of the Sturgeon (Acipenser Sturio), particularly of the Organs of Digestion; the description being illustrated by preparations and drawings.

April 17. G. A. Walker Arnott, Esq. formerly V. P. in the chair. —The Secretary read notices regarding the Appearances and probable Effects of the Aurora borealis in Scotland, in August and September 1829, communicated by Mr Blackadder.—The Rev. Dr Scot read an essay on the Copher of the Song of Solomon, or Henna of the Arabians, the Camphire of the English translation; Lawsonia inermis of botanists.—Dr John Gillies then read an account of an Eruption of Fine Ashes from the Volcano of Peuquenes, in the Andes of Chile, which he witnessed during his travels.

May 1. Robert Jameson, Esq. P. in the chair.—The Secretary read a communication from the Rev. Dr John Fleming of Flisk, on the Superposition of the Strata on the banks of the Tay, and on the occurrence of Scales of vertebrated animals in the old red sandstone of that district.—Dr Walter Adam then read a paper on the different forms of the Human Skull, and illustrated his remarks by the exhibition of specimens.—There was then read an account of a new species of Arvicola, found in the eastern parts of the middle division of Scotland, by Mr William Macgillivray; and, lastly, an Analysis of the Milk of the Hya-hya tree of Demerara, by Professor Christison.—After which the Society adjourned for the season, having completed its twenty-third session.

Robert Jameson, Esq. P. in the chair.—The Reverend Dr Scot of Corstorphine read an essay on the Giants mentioned in the Sacred Writings.—The Secretary read a communication from James Wilson, Esq. giving an account of the great Ourang-outang of Sumatra, illustrated by figures of the hand and foot, of the natural size.—Prof. Jameson then gave an account of Dr Gregory's Analysis of the Compact Ferruginous Marl of the Old Red Sandstone of Salisbury Crags; and also of the same gentleman's Analysis of the Limestone of the Red Burn, near Seafield Tower, in Fife, which is magnesian, but only where in contact with the trap. The Professor also communicated some details in regard to Captain Ross's Expedition, and the splendid display of Polar Lights observed in the Shetland Islands in the month of November last.—A sketch of the magnificent Fossil Tree, at present seen *in situ* in Craigleith Quarry, with a cross section of a portion of the stem, exhibiting very nearly the structure of a coniferous tree, was exhibited to the meeting. 1830. Dec. 11.

1831. Jan 22. Dr R. K. Greville, V. P. in the chair.—Mr John James Audubon being present, read an account of the White-headed Eagle of America (Aquila leucocephala), and exhibited a splendid engraving of the bird, prepared for his great work entitled The Birds of America.—The Rev. Dr David Scot then read an essay on the Selavim, or Quails of the Bible.—After which there was read a letter from an intelligent settler at Swan River, in New Holland, giving a description of the soil and general aspect of the country, which appear nowise so inviting to emigrants as had at first been represented.

Feb. 5. Henry Witham, Esq. lately V. P. in the chair.—The Secretary read an account, communicated by the Reverend Lansdown Guilding of St Vincents, of a new and beautiful species of West Indian Moth, called by him Attacus Wilsonii, (in honour of Mr James Wilson, Librarian of the Society, and a distinguished entomologist). A fine coloured drawing of the perfect insect of both sexes, with the larva and cocoon, was exhibited to the meeting.—Prof. Jameson then made a communication regarding the Flints found in Banffshire by Mr James Christie, Secretary of the Banff Institution. Nodules were exhibited imbedded in a kind of felspar clay. The flint has not yet been detected *in situ;* but Prof. Jameson thought it not improbable that a portion of the chalk formation may be observed in some of the hollows in that district of country.—The Professor next read a learned essay, by a Fellow of the Royal Societies of London and Edinburgh, on the Form of the Ark of Noah, as described in the Pentateuch; shewing that the word *tzohar*, rendered *window* in our translation, rather means *tapering upwards;* and that, with this modification, the form of the Ark was not only admirably adapted for floating, but also for withstanding the shock of waves, although this last quality has been generally denied to it by unscientific commentators.—At the same meeting, the Rev. Dr Scot read a paper on the Alabaster of the ancients.

1831. Feb. 19. Robert Jameson, Esq. P. in the chair.—There was read an essay on the Beacon Lights of Remote Antiquity, communicated by Mr Robert Stevenson, civil engineer. Likewise a paper on the Influence of Rocks on the Nature of the Vegetation which covers them, communicated by Dr Alexander Murray of Aberdeenshire.—At the same meeting, Mr John James Audubon communicated an interesting and graphic description of a Flood of the Mississippi, which he had witnessed during his residence in the western parts of America.

Mar. 5. Robert Jameson, Esq. P. in the chair.—The first paper read was Dr Turnbull Christie's account of the occurrence of Hailstorms within the Torrid Zone, in the peninsula of India.—The Rev. Dr Scot read an essay on the Zebi of the Bible, which he proved to be the Mountain Gazelle, and not the Roe, as in our translation.——Dr Greville, V. P. having taken the chair, Prof. Jameson stated the general results of accurately kept Meteorological Tables, shewing the nature of the weather in the Isle of Man from 1824 to 1830. He also communicated a copy of the Meteorological Register for 1830, kept at Kinfauns Castle, under the direction of Lord Gray; and a similar Register, kept at Aberdeen, by Mr George Innes.—The Professor then laid on the table a copy of a return to an Address of the House of Commons relating to sums of money granted for Mineralogical Purposes in Scotland; from which it appeared, that no part of the money had been granted to this Society, nor to the Edinburgh Museum, although the printed parliamentary votes had mentioned the Mineralogical *Society* of Scotland, and the newspapers had stated, that part of the money was for the Edinburgh Museum; but that the whole sum, amounting to upwards of L. 7000, had been paid to Dr John MacCulloch of Woolwich, for a Mineralogical Survey of Scotland, never until now heard of by men of science in Scotland. It was remarked, that it would be desirable in Government to cause to be published forthwith the results of this expensive and it seems only partial survey of Scotland.—At the same meeting, Prof. Jameson communicated a notice in regard to the Structure of certain Fossil Woods from Van Diemen's Land, shewing, that the ancient Vegetation had resembled that of the Old World, or differed greatly from the present; and read an interesting letter from Mr William Nicol, lecturer on natural philosophy, on the subject of illustrating the structure of woods, fossil and recent, by means of extremely thin slices placed upon glass, and magnified.

1831. Mar. 19. Dr R. K. Greville, V. P. in the chair.—Professsor Jameson read a notice communicated by Mr James Smith of Jordanhill, regarding a Subterranean Forest discovered in the coal formation near to Glasgow.—The Secretary then read Mr James Duncan's introductory Remarks to an extensive Catalogue of Coleopterous Insects collected in the neighbourhood of Edinburgh, and likewise notices respecting the Habitats of the rarer species, and descriptions of two species new to the British Fauna. The specimens of rare and new species were exhibited to the meeting. This communication gave much pleasure to the Society, as affording an earnest of the revival of the study of entomology in this place, where it has been much neglected for a good many years past. It was agreed that the thanks of the meeting be given from the chair to Mr Duncan, who was present; and that he be requested to allow his List of Edinburgh

Coleoptera to be printed in the forthcoming volume of the Society's Memoirs.

1831. April 2. Rev. Dr Brunton, V. P. in the chair.—Mr William Galbraith being present, read extracts of his paper on the Mensuration of Heights by the Barometer, and stated the result of a trigonometrical measurement of the height of Carnethy, one of the Pentlands.—The Secretary then read a botanical communication from Mr William Macgillivray, entitled, Remarks on the Phenogamic Vegetation of the River Dee, tracing the zones marked out by the prevalence of alpine, subalpine, and valley plants.

April 16. David Falconar, Esq. V. P. in the chair.—Professor Jameson gave a discourse on Fossil Trees supposed *in situ*, illustrating his remarks by sketches or diagrams, and shewing that they have in general been floated into their present situations. The Professor also gave an account of Bone Caves in New Holland, and of the general nature of the bones found in these caves; one large bone evidently belonging to a quadruped of the size of an elephant, and not now existing in New Holland.—The Rev. Dr David Scot of Corstorphine then read an essay on the Carob-Tree and its Fruit.

The Society, having completed its 24th session, adjourned.

OFFICE-BEARERS, 1831.

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David Falconar, Esq.
Dr John Boggie,
Rev. Dr Brunton.

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Rev. Dr Scot.
Dr Charles Anderson.
W. C. Trevelyan, Esq.
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1826.
April 8. John Geddes, Esq. Mining Engineer, Edinburgh.
George Lees, Esq. Professor of Mathematics to the Military Academy.
1827.
May 19. David Stewart, Esq. Edinburgh.
Mark Watt, Esq. Edinburgh.
1828.
April 19. Rev. John Gibson Macvicar, A. M.
Nov. 29. Thomas Jameson Torrie, Esq. Edinburgh.
Dr Alex. Turnbull Christie, Edinburgh.
1830.
Jan. 9. Dr John Coldstream, Leith.
May 1. John Topper Gouthwaite, B. A. Cambridge.

NON-RESIDENT.

1826.
April 8. George Edward Frere, Esq. Clydach Ironworks, Brecknockshire.
Thomas Buchanan, Esq. Surgeon, Hull.
Joseph Carne, Esq. Cornwall.
Geo. Cumming Scott, Esq. South America.
H. Stirling, Esq. Hon. East India Company's Service.

1827.
Jan. 13. William Bald, Esq. Civil Engineer.
George Bentham, Esq. London.
1828.
Feb. 9. Dr Anderson, R. N.
1830.
Jan. 9. James Mather, Esq. South Shields.
1831.
Mar. 19. Richard Harlan, M. D. Philadelphia.
Henry MacMurtrie, M. D. Philadelphia.

FOREIGN.

1826.
April 8. M. Adrien de Jussieu, Paris.
M. John Roefer, Göttingen.
M. Achille Richard, Paris.
1827.
Jan. 13. John James Audubon, Esq. Louisiana.
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1828.
Feb. 9. The Chevalier Henri de Struve, Hamburgh.
April 19. Count Vargas Bedemar.
June 21. His Excellency Count Platen, Norway.
Professor Nillson, Lund, Sweden.
1830.
Jan. 9. M. Chauvin, Caen.
Feb. 20. M. De Chaumont, Ingenieur des Mines.
M. De Herault, Ingenieur des Mines.

CORRESPONDING.

Dr Holmes, Montreal.

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BRITISH MUSEUM

PRINTED BY NEILL & CO., OLD FISHMARKET, EDINBURGH.